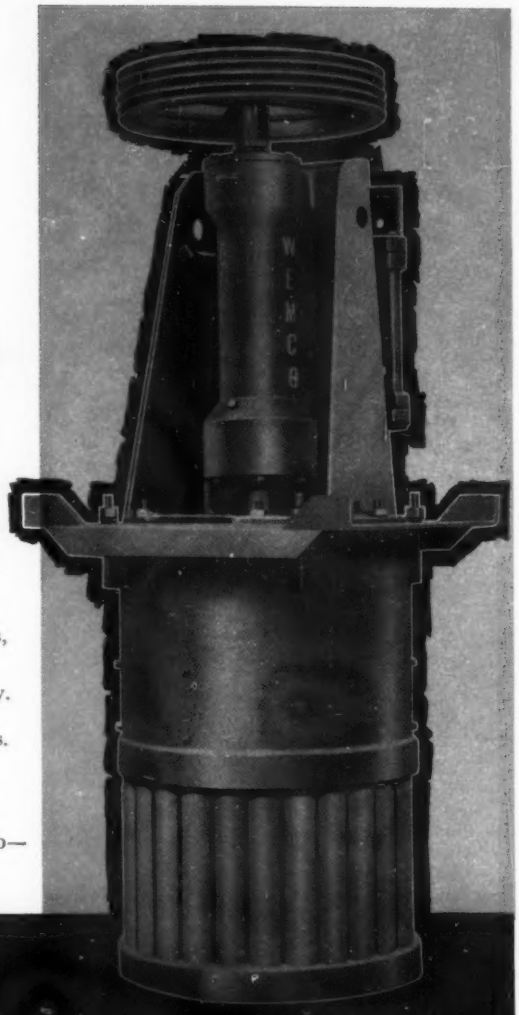
MINING WORLD

Wherever you are, may the true meaning of the Christmas Season – and its joys – be with you.

DECEMBER
1959

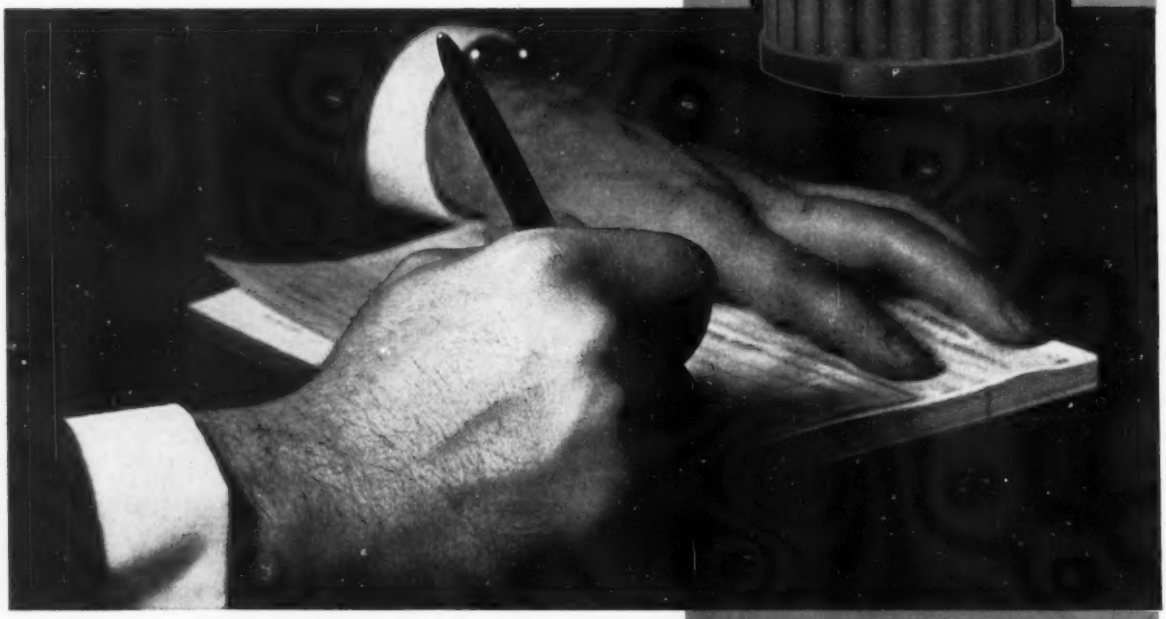
THIS DECISION WILL PAY BONUS PROFITS OF MORE THAN $6,500 EVERY DAY!



This order and installation of Wemco-Fagergren Flotation Machines by a leading coal producer will result in additional profits of over *$6500 per working day*— and for surprisingly low capital investment. Cost of the total plant addition, including the flotation cells, will be offset in less than four months.

This is another example of how Fags go to work—profitably. Recovery is consistently higher; floor space, maintenance and operating labor, reagent and other requirements are less.

The Wemco-Fagergren record of profit-producing installations tells the story of sound experience. The men of Wemco will be glad to furnish all the facts and discuss why Wemco-Fagergren Flotation will do a better job—where flotation has a place.



WEMCO® *a division of*
Western Machinery Company, 650 Fifth St., San Francisco, Calif.
and throughout the world

Here's proof Coromant rope-thread bits and steels SAVE TIME AND MONEY

"Up to double the footage between sharpenings!"
"Premature rod breakage is almost non-existent!"
"40% more usable life—more resharpenings!"
"Bit and rod life are well above average!"
"Uncouple by hand all the time!"
"More rigid—drills straighter holes!"*

**Names of men quoted available on request*

The comments above are actual quotes from project managers, job superintendents, and drill superintendents who have tested new Coromant rope-thread bits and steels. They've learned, on-the-job, the benefits they—and you—can expect!

For example: The new rope-thread (only two turns per inch) holds tight in use, yet permits hand uncoupling. Reports show that the time saved results in more footage drilled per shift. Bit footage is well above average too, with less loss of carbide inserts. Prime quality ore plus nickel-chrome alloy permits cold-rolling from billets for greater strength, life and rigidity. And only with Coromant rope-thread steels can you re-thread without heat treating, too. Do it yourself, or at any nearby machine shop.

Want to know more? There's no obligation on your part, but we'll be glad to help where we can. Just call your nearest Atlas Copco Office, or write to us at Dept. MW-7.

Atlas Copco

610 Industrial Avenue
Paramus, New Jersey
COlfax 1-6800

930 Brittan Avenue
San Carlos, California
LYtell 1-0375

LOW MAINTENANCE COST RATES HIGH WITH TEXAS MINE CHIEF

"Rugged" is the word to describe the No. 977 Traxcavator.

Loading uranium ore for the Texas Zinc Minerals Corporation at its Happy Jack Mine in southeastern Utah, this Cat No. 977 Traxcavator puts in a solid 8 hours a day, 7 days a week.

Mine Chief A. Bernholt cites "low maintenance costs" of the No. 977 and adds, "Working in an isolated area makes service important. I can count on Caterpillar Dealer men when necessary."

The superior stamina and performance of the No. 977, combined with excellent dealer service, keeps the job on schedule under any conditions.

Among the many outstanding features are the exclusive, long-life oil clutch—excellent control and response in tight quarters—and push-button electric starting of the 100 HP engine.

Besides the No. 977 with a 2¼ cu. yd. bucket, you can choose from two other Traxcavators—the No. 955 with a 1½ cu. yd. bucket and the No. 933 with a 1⅛ cu. yd. bucket. Special buckets, including the exclusive side dump, are available on all three machines.

There's a Cat-built Traxcavator that will exactly meet your needs. Plan to call your Caterpillar Dealer soon and ask for an on-the-job demonstration. Then see for yourself how a Traxcavator can pay off for you.

Caterpillar Tractor Co., San Francisco, Cal.; Peoria, Ill., U.S.A.

Now an even more efficient No. 977

LIFETIME LUBRICATED ROLLERS AND IDLERS—with the exclusive floating ring seal—require *no* servicing.

HYDRAULIC TRACK ADJUSTERS—for fast, easy track tension adjustment with an ordinary grease gun.

CATERPILLAR

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FOR FAST LOADING

MINING WORLD

. . . . . including the Export Edition, WORLD MINING

VOL. 21 NO. 13 December 1959

Segregation Process will recover Arizona copper from oxide ores to be mined at Lake Shore claims south of Casa Grande by Trans-Arizona Resources, Inc. Ore will be heated in presence of halide salt and solid reducing agent to form cupreous chloride which is reduced to metallic copper on surface of carbon particles. Cooled furnace calcine is floated to recover copper 19

Super Drills for boring large shafts and tunnels are in the construction stage. A 40-inch diameter prototype has successfully been built and tested in hard granite by the Hugh B. Williams Manufacturing Company. A reverse circulation rotary drill has been developed and is now drilling a 44-inch diameter vertical hole to a depth of 965 fet in Nevada 20

Uranium Assaying by simple color comparison has been developed by National Lead Company's metallurgical staff at Monticello, Utah. Quick and accurate mill control of Ion exchange tailing to prevent solution loss using fused salt bead. Color comparison under ultra violet light gives grade 26

HyL Sponge Iron Plant built at cost of $45.00 per annual ton of capacity demonstrates commercial success of process. Hojalata y Lamina S. A. of Monterey, Mexico uses only 21,000 cubic feet of natural gas to produce 1.0 tons of sponge iron. HyL offers possibility for furnacing ore at mine 28

Electric Wheel truck to be tested on Mesabi Range. The new 55-ton pay load Diesel electric unit built by Unit Rig & Equipment Company will turn 180° in 50 feet. Power is supplied by a 600 horsepower Cummins Diesel driving a generator. Each wheel contains integral electric motor and gear drive assembly 51

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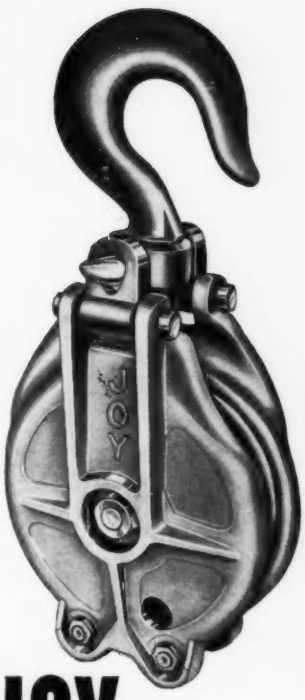
MILLER FREEMAN PUBLICATIONS



JOY quick opening SHEAVE BLOCKS

forged construction

The hook and side plates of the 6", 8" and 10" sizes are *forged alloy steel*. The wheel is chrome-nickel-moly cast steel. All parts are heat-treated for strength and wear resistance.

simple & rugged

There are no pins, chains, bolts or nuts to handle or remove. TO OPEN JUST TURN AND PUSH . . . no parts leave the block to become lost. The rugged opening mechanism will last for the life of the block.

Write for Bulletin 287-8

JOY

Joy Manufacturing Company
Oliver Building, Pittsburgh 22, Pa.

In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario

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Too Much Uranium?

The moment of truth has arrived for many Canadian uranium producers. It came on the heels of the announcement that the United States Atomic Energy Commission would not exercise options it holds for procurement of Canadian uranium in the period 1962-1963 to 1966. The AEC padded the blow slightly by agreeing to a stretch-out of current procurement contracts set to expire in 1962 and 1963.

Small compensation, say the Canadians who have long pressed for a decision on the options that the AEC held on uranium delivery for the 1962 to 1966 period. This attitude is not without some justification. When supplies of uranium ore were limited and the U.S. needed sources of supply, the Canadians jumped in with both feet, developed their great uranium reserves at great risk.

Today some of the Canadian operations are in difficulty, which is a mild way of saying that they are financially hanging on the ropes. The cause in these instances was simply the great rush to push properties into production before reserves and mining problems were adequately evaluated. The AEC decision against exercising options on the Canadian ore will probably result in many mergers or other agreements whereby the strong will swallow the weak among Canadian uranium producers. The battle lines for future world uranium markets are clearly drawn.

Where Are Engineers?

Keen thinking, long-range planners heading the nation's largest mining companies are rightfully concerned with the drastic decline in number of mining graduates from the 29 accredited colleges awarding mining degrees.

Never has the need or demand for engineers been so great as it has today. The opportunities have never been greater, but the demands are for a new breed of engineers—electronic, nuclear, transistor, digital, instrumentation, and pulsed wave to name only a few.

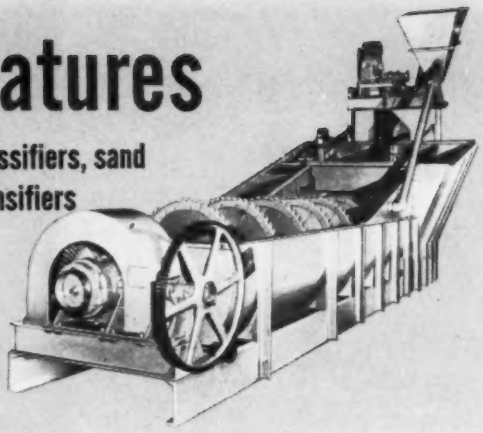
Glamour titles for glamorous research in space and electronics; so glamorous, in fact, that mining engineering, long the ideal of the adventurers and strike-it-rich seekers, has apparently lost its appeal.

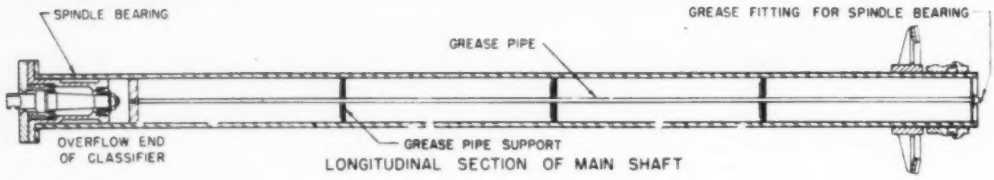
Most of these new engineers are supported by federal government contracts to their employers. It's time the federal government took notice of the mining engineer as a scientist, too. No, not by socializing the profession. Just by a simple tax amendment permitting each company to deduct up to $100,000 per year from income taxes for true mineral industry research performed by staff engineers. Research opportunities are just as glamorous under the earth's surface as they are above it. More so, too, in the long run, because mining and metallurgy produces all the raw materials for space flight and electronic wizardry.

Exclusive Akins Features

which assure low-cost, trouble-free operation of classifiers, sand washing classifiers, heavy media separators and densifiers

50 years of experience in the design, manufacture, and operating performance of spiral classifiers, heavy media separators and densifiers, has proven the importance of the exclusive mechanical features of the Akins machines... importance in terms of metallurgy, and in the economy of long, trouble-free operating life with minimum maintenance.





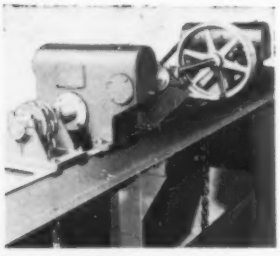
LONGITUDINAL SECTION OF MAIN SHAFT

SUBMERGED BEARING

The patented submerged bearing has proven its advantages of durability, trouble-free operation, and ease of maintenance.

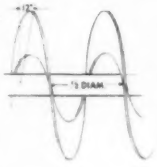
LUBRICATION

The submerged bearing is grease-gun lubricated through a pipe in the main shaft; thus the pipe is isolated from tank contents and protected against breakage. Grease fitting is at upper end of shaft for maximum convenience.



MECHANICAL LIFTING MECHANISM

The lifting device consists of chains, chain sprocket sheaves, and motor-driven or hand-operated reducer unit. Experience has proven this mechanical arrangement to be the most positive, with no possibility of slippage. Minimum maintenance. No packing glands or rods to become worn.

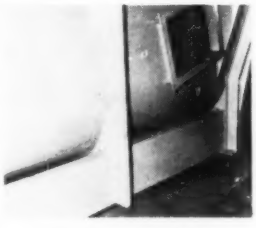


SPIRAL PITCH

50 years of experience has shown that the half-diameter pitch gives maximum raking capacity and results in less slippage and less wear than advanced pitch spirals.

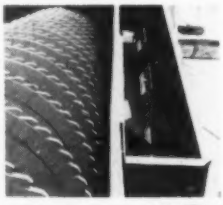
TANK SUPPORTS

Web beam substructure supports tank. There's no load to be carried by tank. This also reduces installation cost by eliminating need for extra sub-structures to support tank.



WEARING SHOES

Wearing shoes are made of various alloys, including Climax 42-A. Patented serrated wearing shoes are available for special applications. Special inner shoes are provided for heavy rake loads.



DRIVE

The bevel gear, V-belt drive has proven to be the most trouble-free and flexible. It permits mounting the motor, or motor-reducer, horizontally; and changing speeds quickly and inexpensively, by simply changing V-belt sheave ratio.

OVERFLOW BOX

An overflow box, with a pipe connection, is furnished as standard... requires only a single connection.

For complete information on Akins machines write for catalogs.

Manufacturing Division

MINE AND SMELTER SUPPLY CO.

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MINING WORLD NEWSLETTER

December 1959

GOLD STRIKE IN DEATH VALLEY, CALIFORNIA . . . is attracting large companies to the southern end of the National Monument. American Zinc, Midwest Oil, Peerless Oil and Gas, and South African Consolidated Gold are all exploring the area.

MEXICO'S FIRST ALUMINUM SMELTER PLANNED . . . for Veracruz. Alcoa and Intercontinental S.A., Mexican investment bank, will form joint firm to handle $20,000,000 project. Initial output scheduled in two years. Eventual rate — 20,000 metric tons/year.

WHITE PINE FINDS ANOTHER COPPER DEPOSIT . . . on company property in Michigan's upper peninsula. The firm, a subsidiary of Copper Range, will explore via shaft to determine extent of ore.

$2,000,000 INVESTMENT IN MOROCCO . . . is planned by U.S.-Moroccan group to mine graphite and vermiculite deposits. New plant would be built; port facilities would be developed at nearby beach for direct shipping.

TWO NEW ASBESTOS OPERATIONS IN CALIFORNIA . . . Jefferson Mining Corp., subsidiary of Jefferson Lake Sulphur, has acquired a major deposit near Stockton, and will build a mill. Purchase price (American Asbestos) $4,200,000. Clute Corp. has acquired Asbestos Bonding Corp. and its 99-year lease on deposit near Napa.

JAPANESE FIRM EXPANDS MILL TO TREAT MORE ORE . . . Copper-lead-zinc mine of Oppu Mining Co. in Aomori-Ken increasing output by 5,000 metric tons, to 13,000 metric tons monthly, as ore reserves increase. Mill capacity will be expanded 25% by June to handle this.

THERE'S PLENTY OF WESTERN IRON ORE . . . and lots of it in California — enough to supply an integrated steel plant for U.S. Steel at Pittsburg, Calif. if project is ever authorized. According to L. B. Worthington, president, the state has iron ore, both in north and south. It's low grade, but locally available.

EAST TENNESSEE ZINC EXPANSION CONTINUES . . . American Zinc Company of Tennessee plans to sink new vertical shaft to develop its new Immel zinc mine east of Mascot. Shaft depth will be over 1,000 feet.

U.S. GEOLOGISTS RUSH TO BELGIAN CONGO . . . to check the carbonatite described on page 19. Kennecott Copper's leading columbite geologists, J. R. Atkinson and R. B. Bracken, flew from New York. E. I. DuPont sent its carbonatite specialist, R. M. Grogan, from Wilmington. Anglo American Corp. of South Africa sent Messrs Edwards and Goetzee. From England came F. W. Williams.

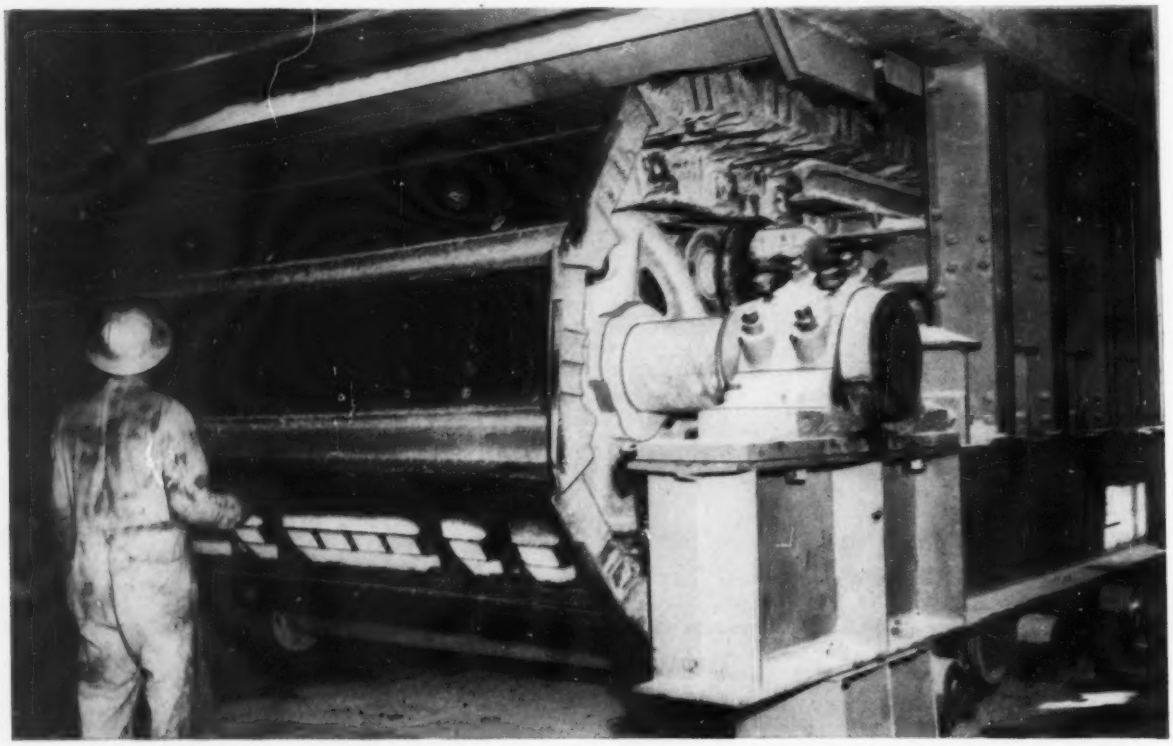
YUBA GOLD NOW IN URANIUM . . . with sale of White Canyon Mining Co. to Yuba. White Canyon is controlled by Texas-Zinc Minerals Corp. and owns 370 uranium claims in San Juan County, Utah. Texas-Zinc bought White Canyon to secure ore from WN and Hideout mines for Mexican Hat mill. No cash was involved — Yuba gave one share of stock for each 33 1/3 shares of White Canyon.

FINANCIAL PROBLEMS MAY DELAY ATLANTIC CITY TACONITE PROJECT . . . of U.S. Steel Corp. planned for Wyoming. Steel strike has upset fiscal picture and if it is resumed, firm may have to postpone many other capital expenditures.

COLOMBIAN GOVERNMENT TAKES MORE APPRECIATIVE LOOK . . . at mining industry. Under consideration are more favorable depletion rules, and more realistic policies.

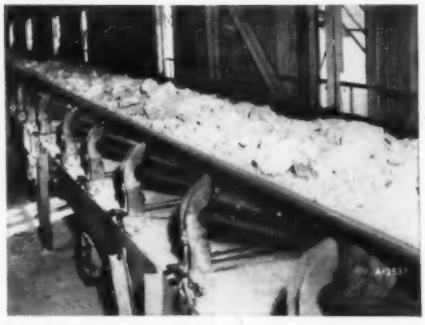
TARIFF COMMISSION HEARINGS ON LEAD-ZINC . . . scheduled for January 12, 1960 in Washington. Commission's report is due to go to Congress by March 31. Domestic producers seek expansion of quotas to cover "manufactured" lead and zinc products.

STEPHENS-ADAMSON

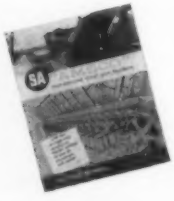


ore handling systems increase tonnage...lower costs

Giant AMSCO Manganese Steel Pan Feeders handle the impact delivered by thousands of tons of run-of-mine ore and stone day after day . . . year after year. The experience of STEPHENS-ADAMSON engineers in the design and construction of Feeders, Apron Conveyors and complete Belt Conveyor systems is a result of 58 years of close contact with bulk handling problems throughout the world. From iron ore in Minnesota to diamond mines in Africa . . . from potash in New Mexico to nitrate and copper in Chile, S-A Engineering "know-how" has produced many of the world's most efficient and profitable conveying systems. S-A engineers with a world of "know-how" and a complete line of manufactured bulk materials handling equipment units are ready to answer your bulk materials handling problem.



A "48" wide primary belt carries a heavy load of 10 inch copper ore to processing at a Southwestern Copper mining installation. STEPHENS-ADAMSON engineered conveyor systems are designed to handle big tonnage dependably and at the lowest operating cost per ton of material handled.



WRITE FOR BULLETIN 255

S-A

MATERIALS HANDLING PRODUCTS

ENGINEERING DIVISION

STEPHENS-ADAMSON MFG. CO.

GENERAL OFFICE & MAIN PLANT, 13 RIDGEWAY AVENUE, AURORA, ILLINOIS

PLANTS LOCATED IN: LOS ANGELES, CALIFORNIA • CLARKSDALE, MISSISSIPPI
BELLEVILLE, ONTARIO

CAPITOL CONCENTRATES

Legal Potash Lease Acreage Is Doubled

A new limit of 25,600 acres in a single mining unit has been set as the allowable acreage for potash leases under terms of new regulations adopted by the Department of the Interior. The acreage now equals the total previously allowed in two separate units.

A statement by the Interior Department said the new regulations would answer a need for more flexibility in potash mining operations on public lands. The former limit of 12,800 acres (plus 2,560 acres for fringe areas) in a single unit was no longer realistic in view of the heavy exploration expenses required to open new potash producing areas, the department said.

The new regulations also established a $0.25 per acre annual rental on new potash prospecting permits, replacing the former regulation that required a filing fee for prospecting permits.

Fluorspar and Cobalt Petitions Denied

Fluorspar is not being imported into the United States in such quantities and under such circumstances as to threaten to impair the national security, according to a ruling issued by the Office of Civil and Defense Mobilization. The ruling was issued in response to a request for limitations on fluorspar imports, filed by the American Fluorspar Producers Association under Section 8 of the Trade Agreements Act.

This petition, filed in October 1958, stated that the domestic industry was threatened with a flood of excessive imports at prices which would force cessation of U. S. production of the mineral. Barter contracts also were cited as stimulating foreign production to the detriment of domestic production. OCDM was asked to recommend to the President that stockpiling of both acid and metallurgical grades of the mineral be extended until a limitation was placed on imports which would enable the domestic industry to maintain an annual rate of production of acid-grade of 250,000 tons and of metallurgical grade of 140,000 tons, with allowable increases thereafter in the same proportion as the domestic rates of consumption increase over the 1957 consumption rate.

OCDM Director Leo A. Hoegh, in his findings, stated that the stockpile is filled and an excess is on hand for both grades of fluorspar; that mobilization demands can be met quite readily; that restrictions on fluorspar imports could affect the economies of Mexico and Canada and lead to retaliatory measures; and that the national security is not being threatened as a result of current imports.

Also rejected by OCDM was the petition of Howe Sound Company relating to imports of cobalt and filed under Section 8 of the Trade Agreements Act. Howe Sound had declared that imports of cobalt would result in closing the domestic mines and thus impair the national security.

Howe Sound Company specifically requested that the government either guarantee a market for its metal by extending the now-expired purchase contract for five years, or by imposing import curbs that would assure domestic producers at least half of the current U. S. consumption of cobalt.

Director Hoegh ruled that the results of any actions to provide protection against imports "would be of greater cost to the government, consumers, and foreign interests than the benefits to be derived." He added that the U. S. is in a favorable position to meet emergency requirements for cobalt and that government stockpiles of the metal are already larger than the objectives required. The decision, he said, was based on a thorough investigation of cobalt supply and demand, defense requirements, stockpile position, and sources of supply.

New Plan Proposed for Lieu Lands

Some changes in regulations have been proposed by the Department of Interior. The proposed revision will permit states to select mineral lands from unappropriated public domain lands in place of other lands granted to a state when the original grant lands are not available because of prior appropriation. The proposed regulations are designed to carry out provisions of Public Law 85-771, enacted in 1958.

While the most important change in the law, and incorporated in the proposed regulation, is the right of states to select mineral lands in lieu of original lands which were not available. The state now will be permitted to select lands under a federal mineral lease if the lands are not developed for mineral production at the time of selection. The states also will have a preference right to select public lands released from a federal withdrawal or reservation, the preference right to expire in 1968.

New Change in Labor Act Is Suggested

Press reports indicate that Labor Secretary James Mitchell plans to ask Congress for certain changes in the Taft-Hartley Act's provisions relating to emergency strike conditions.

The major change he will recommend is a provision to give the Federal Mediation and Conciliation Service the right to ask the President to appoint a board of inquiry before a strike has started or during mediation processes. Such action, he explained, would force early definition of the issues. At present, he said, the President can only appoint such a board after an emergency situation has occurred.

Hint Lead-Zinc Quota Removal

The recent increase in the lead and zinc prices have give rise to a rumor that pressure on the White House and the State Department from foreign lead-zinc producing countries may induce the President to remove quotas as soon as possible. When President Eisenhower was in Mexico reports stated that he promised Mexico's President to take whatever steps he could to increase Mexican mineral imports into the United States.

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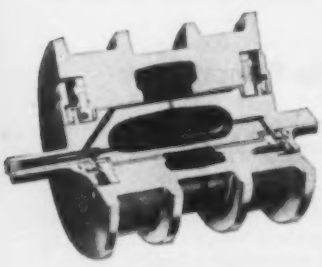
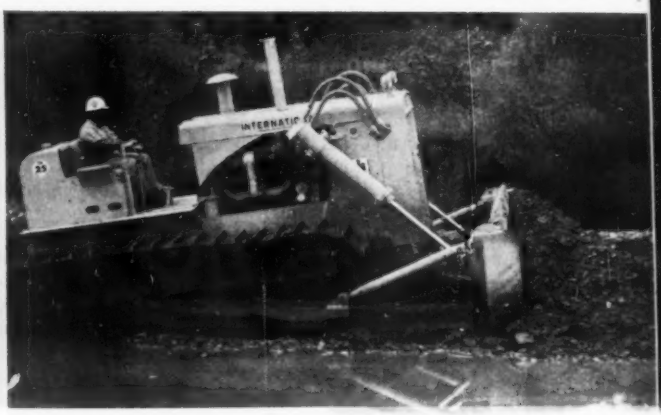
team new 230 diesel hp, new traction..

You "gain ground" on all four steps of the push-loading cycle with the torque-converter TD-25. (1) you slow-down by power-shifting down and using decelerator to get feather-touch contact; (2) power-shift either track up or down to maintain solid pusher contact on curves; (3) get gear-higher kick-outs with on-the-go power-shifting; (4) reposition faster, with higher-than-ordinary reverse!



Dual-protected TD-25 Dura Rollers have precision-fitted, metal-to-metal cartridge-type sealing—to exclude abrasives and retain lubricant. These rollers have pressure relief passages so they can be power-lubricated—without affecting seal life or efficiency. Dura Rollers have king-size lube reservoirs, to make twice-a-year lubing practical!



on-the-go Hi-Lo power-shifting

...to outearn other rigs up to 50%!

You Power-Steer and Power-Shift the new International TD-25, with 2-finger ease! Exclusive, years-proved Planet Power steering gives you full-time "live-track" power and traction to make full-load turns and eliminate "dead-track drag." Hi-Lo on-the-go power shifting instantly matches power to conditions to prevent losing momentum!

Exclusive Efficiency-Range Control

Exclusive International Hi-Lo power shifting makes the TD-25 the industry's only 4-speed torque-converter crawler, and the only one with load-matching, efficiency-range control. In the synchro-mesh transmission TD-25, the Hi-Lo planetary system gives eight speeds forward and reverse—with cycle-speeding up-or-down, on-the-go shifting!

You get big-capacity teamwork of 230 diesel horsepower with the new 7-roller tracks, platformed on super-rugged, double-box-beam frames—and carried on International's new minimum-maintenance Dura Rollers! Over 39 square feet of ground-gripping traction area harness the "25's" great power!

You simply press the direct-start button, to command the "25's" free-breathing diesel horsepower. Dual valving of the "25's" high-torque DT-817 engine provides for peak turbocharging efficiency—to deliver full-rated power from sea level to timberline!

Full performance is at your fingertips, full time. No wonder the TD-25 outearns same-sized clutch-steered crawlers up to 50%—on a wide range of tough jobs!

You don't spill the "pay" part of your load with the TD-25—even when you change speed making the "pass." Hi-Lo on-the-go planetary shifting keeps the blade fully loaded—even when dozing round curves, benching, or side-casting! See how the "25" can help you pocket bigger profits.

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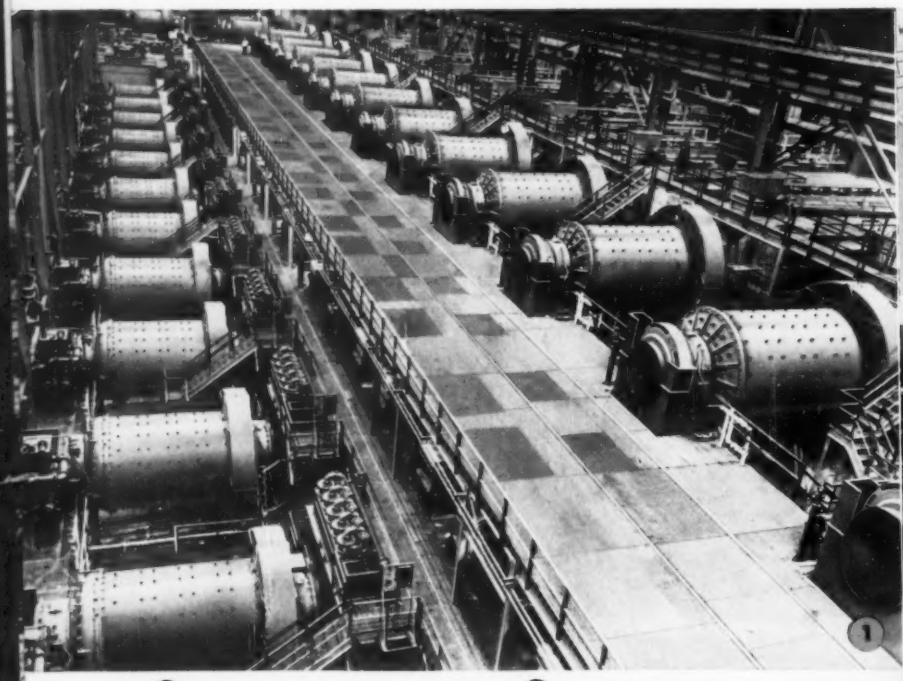

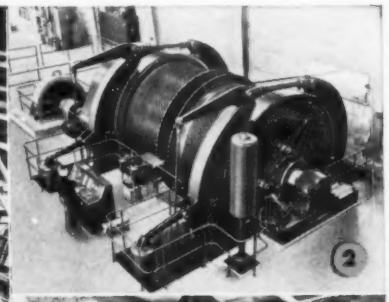

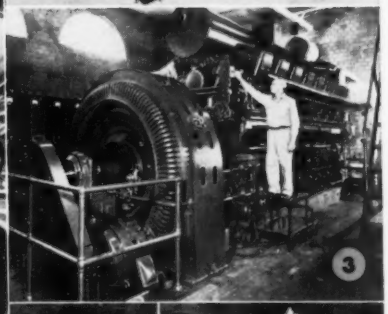

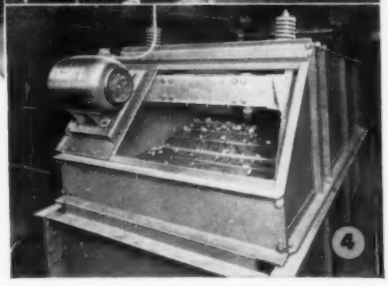

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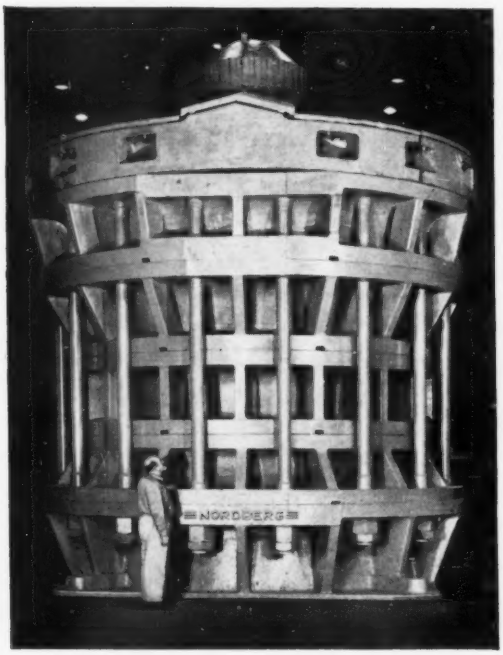
(Illustrated at the right is a typical installation of Symons Cone Crushers and Rod Deck Screens serving a large Taconite Iron Ore producer).



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Four of Merritt-Chapman & Scott's seven 6-yd. Lima Type 2400 Shovels are shown working on the excavation site of the Niagara Power Project's main generating plant at Lewiston, N. Y.

Four contractors use 17 Limas on giant Niagara Power Project

Wherever there is a really tough job to be done—when high production, dependable heavy-duty service, rugged power, and low operating cost are essential—you are almost certain to find powerful Limas chosen for the task.

The $720,000,000 Niagara Power Project is a big job—one of the biggest. Four of the project's contractors are using a total of 17 high-output Limas on their jobs! The duty roster includes 11 big 2400's which can be used interchangeably as 6-yd. shovels, variable capacity draglines and cranes; one Type 802 50-ton crane; two 4-yd. Type 1601 shovels; one Type 1201 which can be used as a 3½-yd. shovel or 70-ton crane; and two 35-ton 54-T truck cranes.

Around the world, profit-minded contractors know from experience that it pays to buy Limas. They are quality-built throughout to deliver high production at low operating and maintenance costs.

Quality Lima Features

Here are a few examples of the superior features found in the Lima Type 2400—extra strong and rigid rotating base supported by oversize conical rollers in conjunction with double flanged heat-treated roller path and separate hook rollers; horizontal gear train and swing bevel gears are pump-lubricated in oil-tight case; anti-friction bearings are used throughout. Induction hardening of all wearing parts increases life. Crawler bushings are equipped with piston-ring type oil seals. Torque converter adjusts load speed to correspond with the resistance to moving the load—no engine stall.

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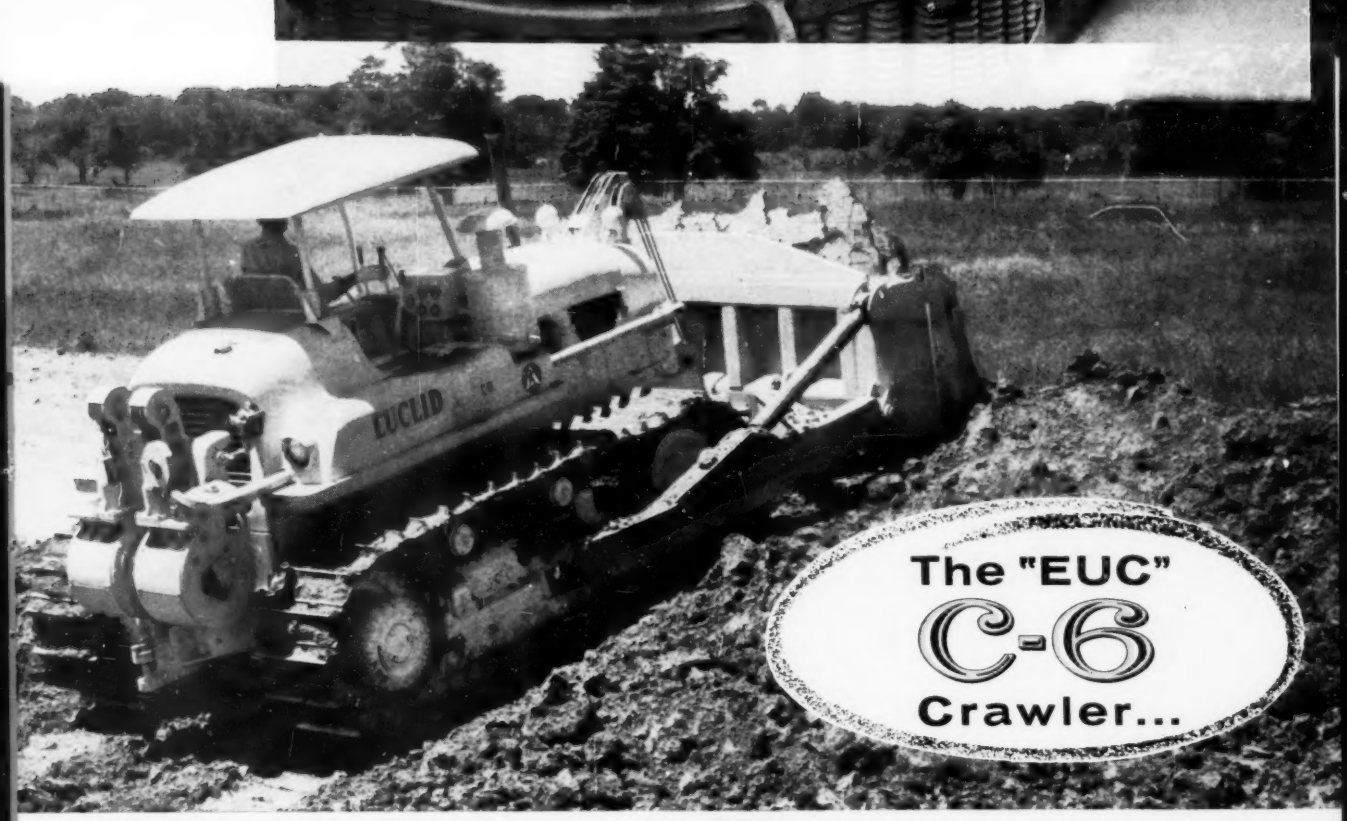

a brand new 5 year old!

Here are just a few of the many features that put this new C-6 "Euc" years ahead of competitive crawlers:

Proven Torqmatic Drive . . . performance tested and proved in thousands of Euclid earth-movers on the toughest jobs.

Full Power Shift . . . no master clutch . . . easy operation and "fast as a fox" maneuverability that cuts work cycle time.

Fast, Positive Response . . . common steering and braking control, plus Torqmatic Drive for smooth operation on all tractor work.

Better Track Alignment . . . track roller frames are pivot mounted ahead of final drives . . . advanced design of front equalizer bar maintains positive alignment.

Low Maintenance Costs . . . easy accessibility of major components . . . no adjustment of steering clutches and brakes required . . . fewer lube points . . . dry type air cleaner . . . 7 track rollers . . . no tractor weight on final drives . . . recoil system eliminates mechanical springs.

No other Euclid product has ever had the thorough testing—both on proving grounds and on actual jobs—that the C-6 tractor has undergone during the last 5 years. All of the product refinements and improvements resulting from this exhaustive test program, plus Euclid's really new concept of crawler design, make C-6 performance a new standard for comparison in the 200 h.p. tractor class.

Have your Euclid dealer give you the facts and figures on the C-6 . . . compare performance as well as specs with any tractor in its class and you'll see what this new standard of tractor versatility can mean to you in better production and return on investment.

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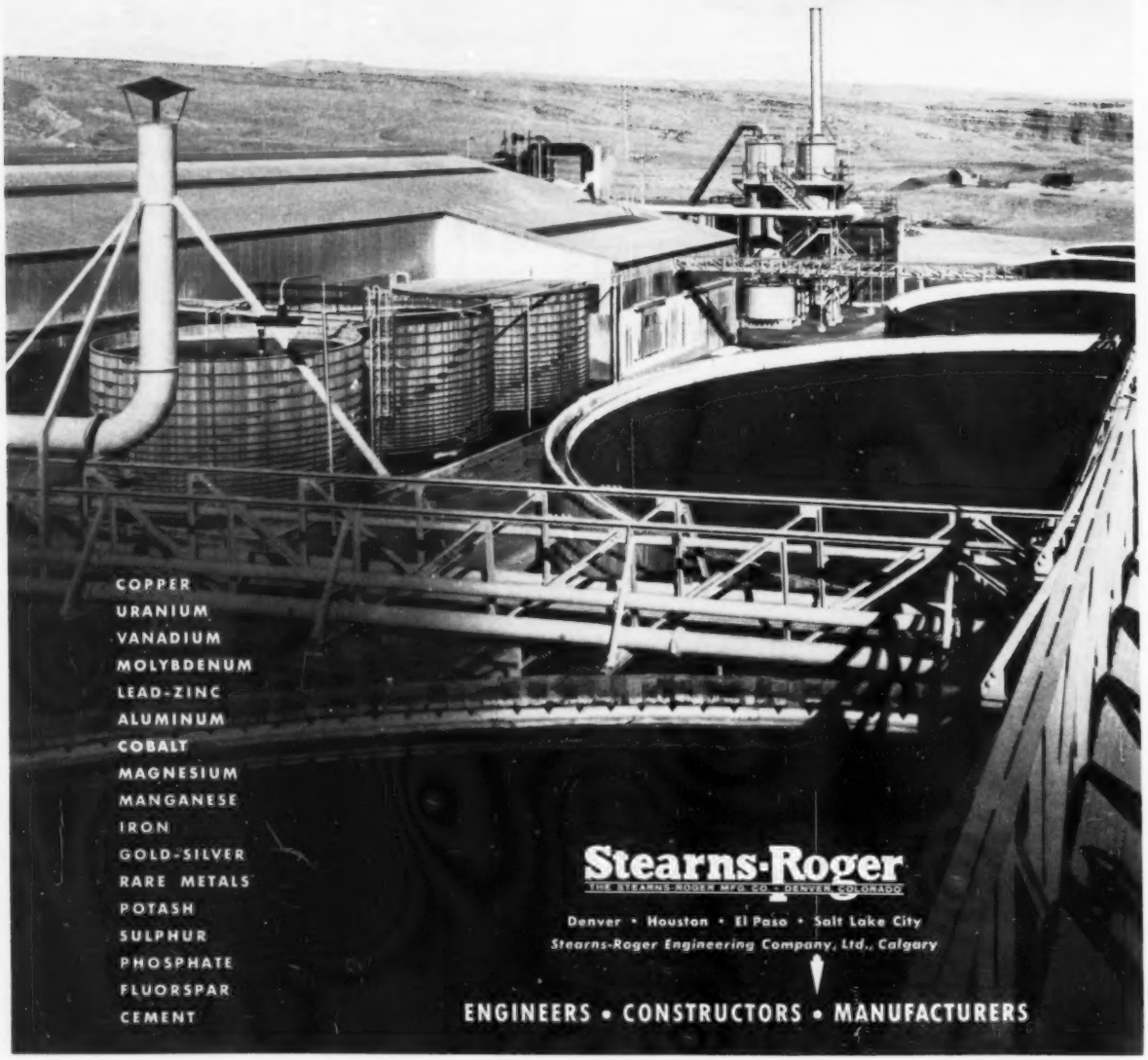

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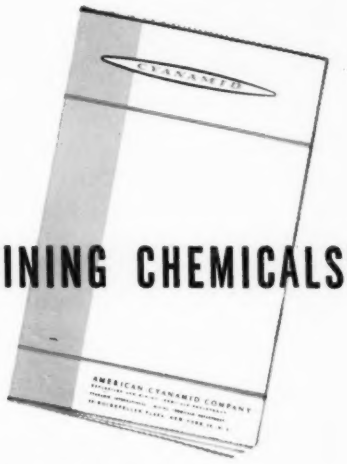

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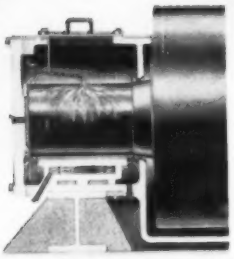
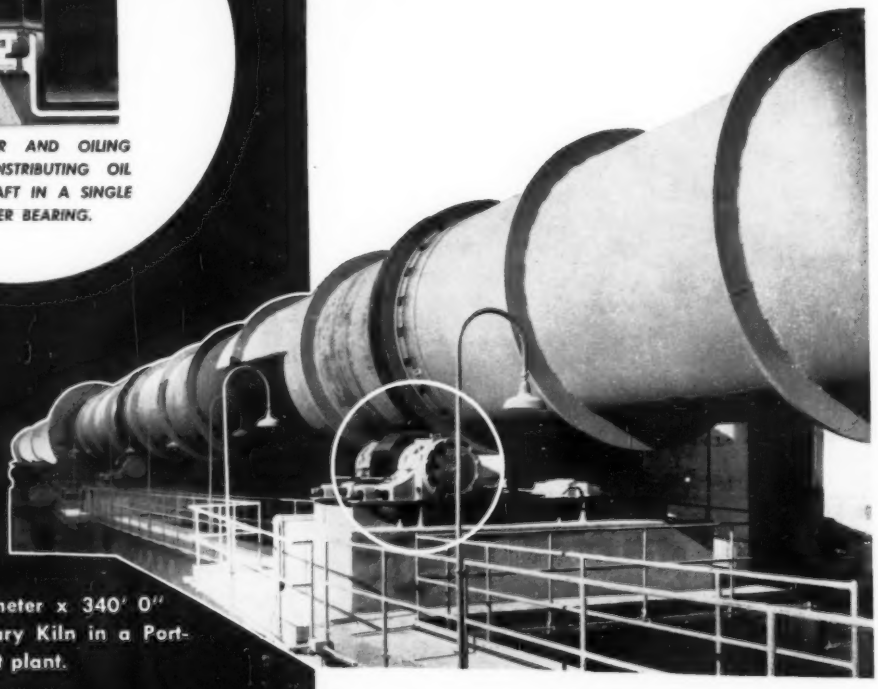


OIL RESERVOIR AND OILING MECHANISM DISTRIBUTING OIL OVER THE SHAFT IN A SINGLE SUPPORT ROLLER BEARING.



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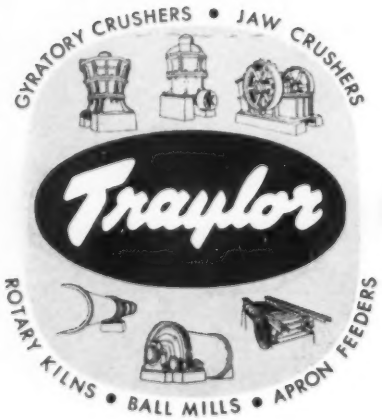

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Congo Deposit Is Potential New Source for Columbium

An important deposit of pyrochlore containing two types of carbonatite ore is being developed by a new firm called Somikubi (Societe Miniere de Nyamukuki), formed by Comite National du Kivu and Compagnie Miniere des Grands Lacs Africain.

The deposit is northwest of Rutshuru in the Kivu of the Belgian Congo. It is composed partly of unaltered carbonatite and partly of ferruginous ore, both connected with a syenite core. The hard unaltered core is mainly of the sovite type and contains 0.55 percent Cb_2O_5; the adjacent, but unconsolidated, ferruginous deposit contains at least 30,000,000 tons assaying 1.34 percent Cb_2O_5.

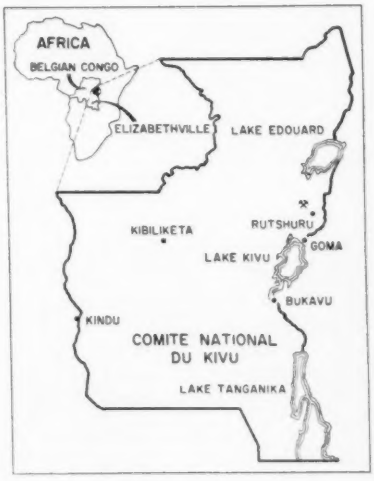
The characteristics of the deposit are favorable to economic development. The pyrochlore is not too fine grained and is not coated with iron oxides. It is easily accessible. Concentration processes are now being studied.

Carbonatite is the term given to carbonate rocks which are associated with alkaline igneous intrusions. There is no unanimity of opinion regarding its origin—that is, whether it is of intrusive origin or not.

In the past 10 years, a large number of these carbonatites have been discovered in central Africa, extending along or near the great Rift Valley from Nyasaland north into Tanganyika. All of them contain columbium minerals; in fact, a number have been considered as a commercial source of columbium. Probably the best known and most extensively developed is the Panda Hill deposit at Mbeya, Tanganyika, where the Mbeya Exploration Company has developed about 300,000,000 tons carry-pyrochlore $[(CaNa)_2(Cb,Ta)_2O_6F]$. A pilot plant has been built to treat 200 tons per day.

At least three columbium-bearing carbonatites are known in Nyasaland. These include one on Chilwa Island, one at Tundula Hill, and the recently mapped Ilomba Hill in the northern section close to the boundaries of Tanganyika and Northern Rhodesia.

Probably the nearest thing to the African carbonatite in the United States is a similar deposit near Powderhorn, in Gunnison County, Colorado, owned by the Du Pont Company, which is estimated to contain 100,000 tons of columbium oxide. Du Pont has conducted aerial surveys and has diamond drilled the deposit as a columbium reserve because the firm has done extensive research into production and use of the metal and its alloys.



Segregation Process To Be Used at New Copper Project

Transarizona Resources, Inc., has started stripping operations on a copper deposit 28 miles south of Casa Grande, Arizona. By next spring the company expects to have the first commercial plant in North America in operation using the widely discussed segregation process. The segregation process is reported to produce a fine flake copper which is then recovered by conventional copper flotation methods.

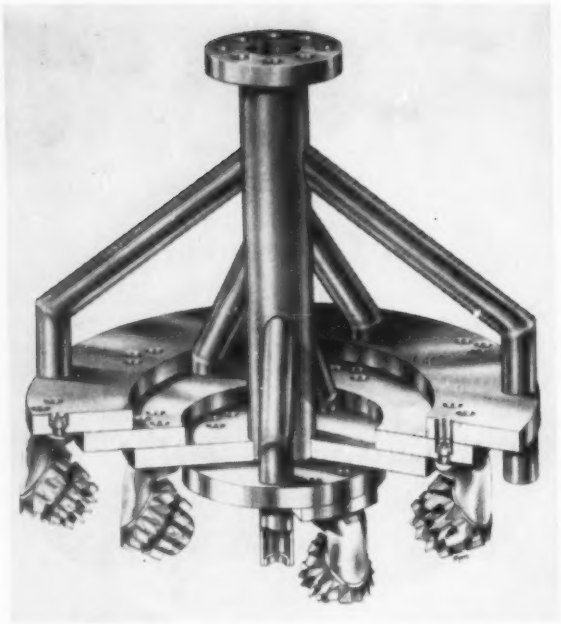
The property consists of three patented claims in the Lake Shore group, a section of ground adjoining the Papago Indian Reservation, and 20 additional claims known as the Drake group. The blocked out ore reserve is said to grade 2 percent copper and 15 percent recoverable iron.

Transarizona has purchased the flotation mill of the Three C Ranch mine at Oracle, Arizona and will move the equipment to the property under development. Plans call for an initial production rate of 500 tons per day with an increase to 1,000 tons per day just as soon as the recovery process has been proven.

The segregation process consists of heating oxidized or mixed oxide-sulphide copper ore to 500 to 800° C. in the presence of a halide salt and a solid reducing agent, such as coal or coke. The mechanism and reactions of the segregation process are not clearly defined. It is believed that on application of heat to the charge of ore, salt, and coke, the salt decomposes and reacts with hydrous clay minerals with the formation of hydrochloric acid. The acid attacks the copper minerals to form volatile unstable cupric and stable cuprous chlorides. The unstable cupric chlorides probably decompose with the formation of cuprous chloride and free chlorine. The atmosphere in the furnace is weakly reduced under ideal conditions and the copper chlorides are reduced to metallic copper on the surface of the carbon particles by any one of a number of reactions.

The segregated copper tends to agglomerate during the furnacing with formation of flakes finer than 65 mesh. Careful manipulation of furnacing conditions are required to obtain ideal reduction of copper in a segregated condition in the charge. The furnace calcines are then cooled and subjected to flotation.

George Freeman of Casa Grande is operating manager of Transarizona in which a controlling interest is held by Transcontinental Resources Ltd. Consulting geologist for the project is Manning W. Cox of the firm Wisser and Cox in San Francisco.



NEW ROLLING CUTTERS can be mounted on plate type bits and formations from softest soils to hardest granites can be drilled in infinite diameter ranges if proper weight, horsepower and rotation speed is provided.

Presented at 9th annual drilling symposium at Pennsylvania State University by James H. Allen, chief engineer, Hugh B. Williams Manufacturing Co.

SUPER

Introduction . . . Most ultimate mechanization schemes for underground hardrock mining would probably revolve around continuous cutting and boring machines to some extent. So far, such tools haven't been generally available because bits and cutter heads couldn't take the severe abrasive service demanded in most metal and non-metallic mining. But new developments in rotary bit design and rolling cutters are changing this picture.

Large-diameter rotary drilling machines described by this report were perfected from techniques used in the oil industry for 100 years. It is believed that concepts for machines to drill 20-foot-diameter holes are now within the range of practicality and can be developed from some of the drilling principles employed by these machines.

The extent to which rotary drilling can be more economically employed in place of conventional shaft sinking

From Coal – Core drilling and

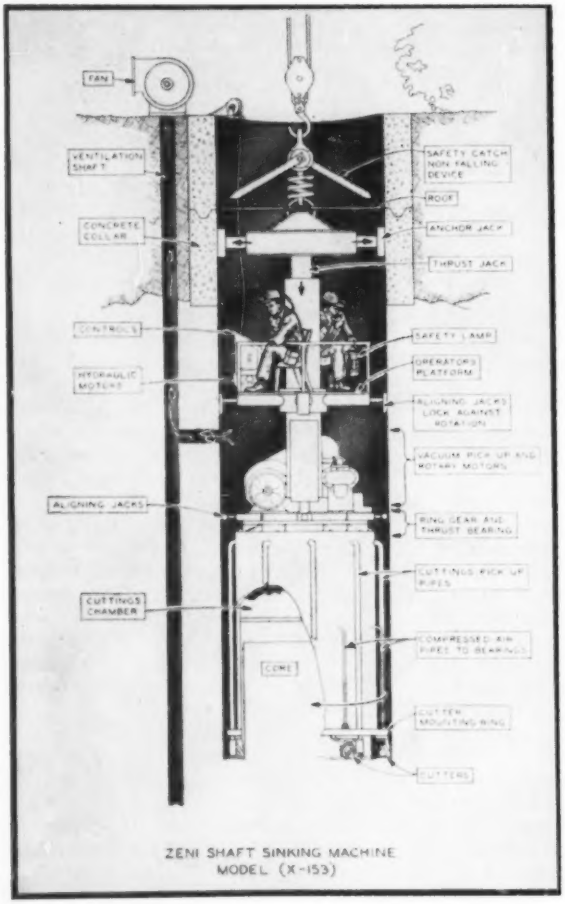
Hardrock Core Drilling Machine . . . In 1953 the Coal State Construction Company and, later, the Zeni Corporation, a Morgantown, West Virginia, shaft sinking firm, saw the need in the coal mining industry for faster and more economical methods of drilling 6-foot-diameter mine ventilation and portal shafts in hard rock. This company started the development of a 76-inch-diameter core drilling machine.

The Hughes Tool Company of Houston, Texas designed a special, individual cone, rolling cutter mounted on a conventional tri-cone type bit bearing for the Zeni machine. Six of these cutters were employed on the bottom of the Zeni core barrel.

After a series of laboratory tests were made to test the cutters, the first mine shaft was drilled with the core machine at a drilling rate of three feet per hour in hard sandstone. To date the machine has completed 14 mine shafts, many to depths of 500 feet.

The machine is now powered with two 25-horsepower electric motors for rotational power, a 7½-horsepower vacuum pump motor for cuttings removal, and a 7½ horsepower hydraulic system motor. The hydraulic system is designed to provide 100,000 pounds of thrust force against the six cutters, which cut the 76- by 68-inch kerf. The core barrel rotates at about 7 revolutions per minute. Design, development, and construction costs for the core machine have been estimated to be $100,000. Replacement costs today might approach $200,000 with new equipment.

Hard Rock Shaft Sinking Machines . . . The original Zeni Corporation was reorganized under the name of Zeni-McKinney-Williams Corporation in 1957. A second shaft sinking machine was developed to drill a 76-inch-



ZENI SHAFT SINKING MACHINE
MODEL (X-153)

ZENI shaft sinking machine uses rolling cutter bits on a barrel structure. Normal work crew is four men; supporting equipment consists of crane, compressor, fan and core catcher.

Mining Equipment for the Future | Part 1

DRILLS for boring shafts and tunnels

and tunnel driving methods remains to be defined. The economy of large-diameter rotary drilling equipment has been proven in many soft and medium soft formations; more work is needed for the drilling of large diameter holes in very hard rock.

In Holland and Germany, 25-foot-diameter shafts sunk in bad formations by rotary methods are less expensive than those put down by other methods. The economical limits to the diameter of full-size hole drilling in medium hard formations may be eight to 10 feet and even less in very hard formations. These limits can perhaps be expanded by rotary coring which would substantially reduce rolling cutter costs.

The revolutionary machines now under development probably represent the infant concept of powerful drills that are yet to be conceived in the next decade.

Oil Provided These Basic Developments

Date	Development	Remarks
1859	Cable tool drilling	Developed by Edwin Drake and was used for 41 years before a better technique was devised.
1900	Hydraulic rotary drilling process	Employed by Capt. Anthony Lucas to discover the Spindletop oil field near Beaumont, Texas.
1909	Rolling cutter bit	Invented by Howard R. Hughes, it proved such a valuable tool that rotary drilling techniques were soon employed all over the world.
1909 to 1959		Drilling equipment became more sophisticated and powerful as a result of enormous amount of research.

large shaft sinking machines

diameter shaft by enlarging a 12¼-inch pilot hole to full diameter in one pass. This machine eliminated the need of core extraction by utilizing a cuttings flush system which flushes or blows cuttings down the pilot hole into a mine entry. They can then be removed through a 20-inch ventilating hole that is sometimes drilled nearby, or they can be handled by mine cars on the main haulage way.

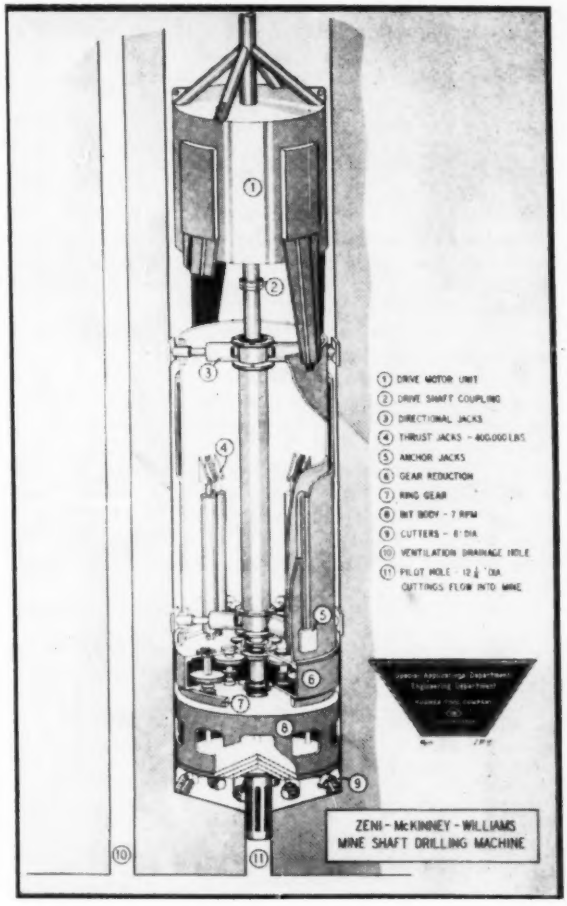
The machine has three 60-horsepower electric motors for rotational power. The hydraulic system is designed to provide 450,000 pounds of thrust against the 14 to 22 rolling cutters mounted on the cutter head. The cutter head rotates at 6 revolutions per minute.

Five-man drill crews put down two 536-foot shafts near Beckley, West Virginia with the Zeni-McKinney-Williams unit. The machine drilled the second shaft at Beckley in record time, often averaging up to 34 feet of 76-inch hole in an eight-hour shift. During the work near Beckley, a very hard crystallized sandstone was encountered. In order to economically drill this formation, a new, harder formation cutter was designed and developed.

Rolling cutters are now available for this machine that can be utilized to drill granite and quartzite.

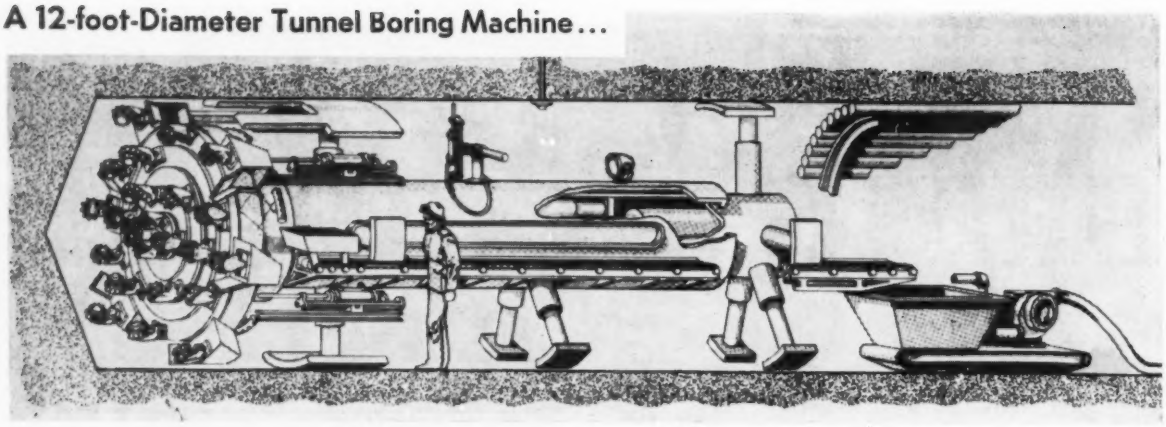
The principal limiting factor in the employment of the sinker is that an existing mine entry must be present under the location of the proposed shaft to provide space for cuttings removal. This limitation, however, can be eliminated in future machine design by any one of several different cuttings removal methods.

The machine weighs approximately 69,000 pounds. The design, development, and manufacturing cost of the shaft sinker and the supporting surface rig has been approximately $175,000.


1 DRIVE MOTOR UNIT
2 DRIVE SHAFT COUPLING
3 DIRECTIONAL JACKS
4 THRUST JACKS - 400,000 LBS
5 ANCHOR JACKS
6 GEAR REDUCTION
7 RING GEAR
8 BIT BODY - 7 RPM
9 CUTTERS - 8' DIA
10 VENTILATION DRAINAGE HOLE
11 PILOT HOLE - 12¼" DIA
CUTTINGS FLOW INTO MINE
ZENI - McKINNEY - WILLIAMS
MINE SHAFT DRILLING MACHINE

ZENI-McKINNEY-WILLIAMS shaft sinking machine was logical outgrowth of the coring unit. Five man crew with supporting surface equipment has been used with this rig.

A 12-foot-Diameter Tunnel Boring Machine...



The development that hardrock miners have waited for . . .

To develop the design of a 12-foot-diameter tunnel driver that would incorporate some of the principles employed by the ZMW shaft machines, the Hughes Tool Company engaged the services of the Hugh B. Williams Manufacturing Company in June of 1958. The goal was to come up with a unit suitable for horizontal hardrock drilling.

Preliminary studies and design were completed by January 1959. At that time it was decided to build a prototype or working model of the proposed 12-foot machine in order to obtain additional research data on rolling cutters. A further objective was to obtain design and operational data on future large-diameter hardrock drills. The 40-inch prototype was developed and constructed by July 1959. It was designed to drill rock that possessed a compressive strength of 7,000 pounds per square inch at a rate of eight to 12 feet per hour.

The prototype was tested recently in a soft, upper Cretaceous limestone near Dallas, Texas, and was later tested in a hard pink granite near Marble Falls, Texas. The maximum drilling rate in the soft limestone formation exceeded 24 feet per hour. The average rate of hole advance was 12 feet per hour. The prototype drilled the hard granite at a rate of three to 3⅜ feet per hour.

At this time, the only modifications that would be proposed in scaling-up the prototype design to a full 12-foot-diameter unit would be in the hydraulic system. The wall crowd force to horizontal thrust ratio (see table) would probably be increased. Preliminary tests yielded pleasing results with regard to cuttings removal, cutter performance, rotational speed, and horsepower. We feel that a larger machine would be simpler to construct than the small machine because of space increase in a larger diameter hole.

Structural Details . . . The 40-inch-diameter machine is comprised of two basic structural components; i.e., the inner sliding member and the outer sliding member. The inner sliding member consists of the cutter head, the power shaft, the gear reduction unit flange, the gear reduction unit, the 75-horsepower electric motor, the hydraulic pump and motor, the hydraulic tank and solenoid valves, the screw conveyor motor, the screw conveyor and housing, and two 4-inch auxiliary cuttings removal pipes. These members are all inter-connected and move in a horizontal plane as one unit.

The outer sliding member consists of four 6-inch hydraulic thrust cylinders and the eight 5-inch wall jacks or wall crowd cylinders. All of the hydraulic cylinders are attached to the outer structural member and they move together in a horizontal plane. The 2¾-inch piston rods of the four 6-inch thrust cylinders are attached to the cutter head of the inner sliding member. This is the only connection between the two structural components. The inner and outer sliding structural members are fabricated from angle iron. High wear-resistant plate has been installed between the two members to reduce wear as they slide over each other.

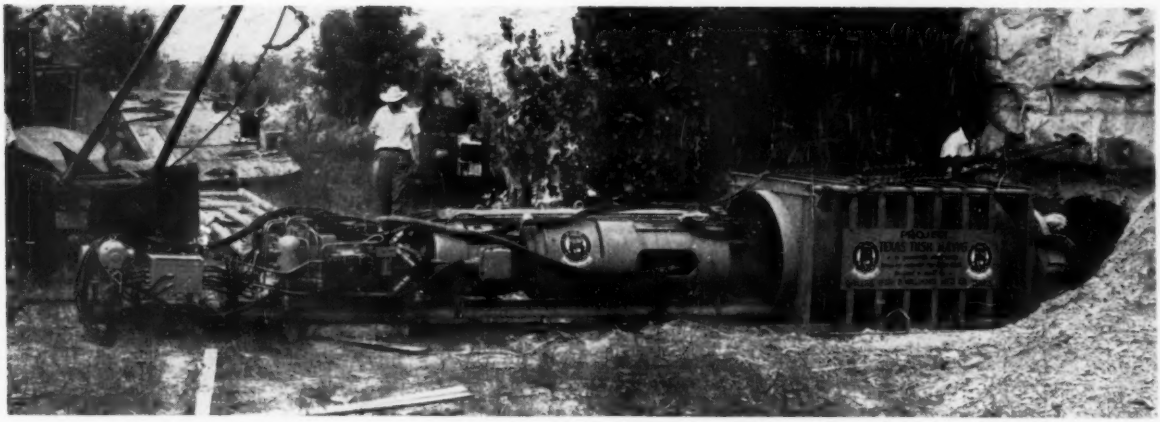
Rotational Power System . . . Rotational power for the 40-inch machine is supplied by a 75-horsepower electric motor. The motor is rated as follows: 220/440 volts, 3-phase, 60-cycle, 190/95 amps, and 1775 revolutions per minute. The motor is operated on a 440-volt electrical system. A gear reduction unit is flanged to the motor as an integral part. Rotational speed is reduced from 1775 to 16.5 revolutions per minute in this unit. The gear reducer output shaft is coupled to a 7-inch O.D. hollow power shaft by a 12¾-inch pitch diameter, No. 200 chain, sprocket coupling. The power shaft is approximately 10 feet long and extends through the inside of the square, inner sliding member to the front of the machine. This shaft is supported at the rear of the inner sliding member by a tapered roller radial bearing, and at the front by a steep angle thrust bearing. The cutter head assembly is attached to the front of the 7-inch power shaft by splines and is retained by a 6-inch threaded nut. The cutters can be supplied with either air or water by a 1¾-inch hole through the center of the power shaft.

Hydraulic System . . . The machine is equipped with a 5-horsepower, 440-volt electric motor, and a combination (low volume, high head—high volume, low head) hydraulic pump. Five 110-volt solenoid valves are used to control the various hydraulic cylinder operations. The pump,

Prototype Data

Hole size	40 inches
Rotation power	75-horsepower
Cutter head speed	16.5 RPM
Thrust force	226,400 pounds
Wall crowd force	313,600 pounds
Conveyor capacity	250 cubic feet per hour
Approximate weight	16,000 pounds
Approximate length	27 feet

supporting surface equipment has been used with this rig.



The above 40-inch prototype has already been field tested

motor, and valves are mounted on a 30-gallon hydraulic reservoir at the rear of the 75-horsepower electric motor. The hydraulic system is equipped with the necessary relief and check valves, filters, air breather, accumulator, and inter-connecting piping.

The system is operated on a pressure of either 1500 or 2000 pounds per square inch by making a simple adjustment on the pump. When operated at the higher pressure, the four horizontal thrust cylinders exert a horizontal thrust or drilling force of 226,400 pounds. At this pressure the wall crowd force of the eight wall jacks is 313,600 pounds. When the system is operated at 1500 pounds per square inch the horizontal force is 169,600 pounds and the wall crowd force is 235,000 pounds.

The two rear bottom wall jacks are operated independently and each jack is controlled by an individual solenoid valve. This feature was incorporated in an attempt to gain a degree of vertical directional control as well as a degree of horizontal directional control. The two rear bottom jacks are located near the center of gravity of the machine. Another solenoid control valve is used to set the remaining six wall jacks after the two bottom rear jacks have been properly positioned.

A fourth solenoid control valve is used to operate the thrust cylinders at a rate of advance of about 20 feet per hour. This valve is used to control thrust for normal drilling operations. A fifth solenoid valve is used to operate the horizontal thrust cylinders at a much faster rate of travel when the machine is not drilling. This valve is also used to retrieve the machine from the hole or advance it in a partially completed hole.

Cuttings Removal System . . . . Rock cuttings or chips removed from the rock face by the rolling cutters fall to the bottom of the hole. There they are wiped by the 40-inch cutter path wipers to the cuttings scoop immediately behind the cutter head. In the center bottom of the cuttings scoop there is approximately 12 inches of 5-inch-diameter, uncased, double pitch screw conveyor. The screw conveyor is 25 feet long and all but the 12 inches exposed in the open cuttings scoop is housed in a standard weight 6-inch pipe. The conveyor is supported in the 6-inch pipe by four white iron hanger bearings. The conveyor is rotated at 161 revolutions per minute by a 440-volt, 3-horsepower electric motor at the extreme rear of the machine. The conveyor is designed to handle approximately 250 cubic feet of material per hour. The screw conveyor housing pipe rests or slides along the bottom of the 40-inch hole. On either side of the conveyor housing there are two 4-inch auxiliary cutting removal pipes that are used for a water flush system. 150 gallons per minute of water are pumped to the cutter head and returned with the cuttings through the screw conveyor.

The cuttings conveyed to the machine rear are discharged from the 6-inch housing through a slot in the side immediately in front of the conveyor motor. A reversing switch is installed in the conveyor motor electrical system to unclog the screw should this become necessary.

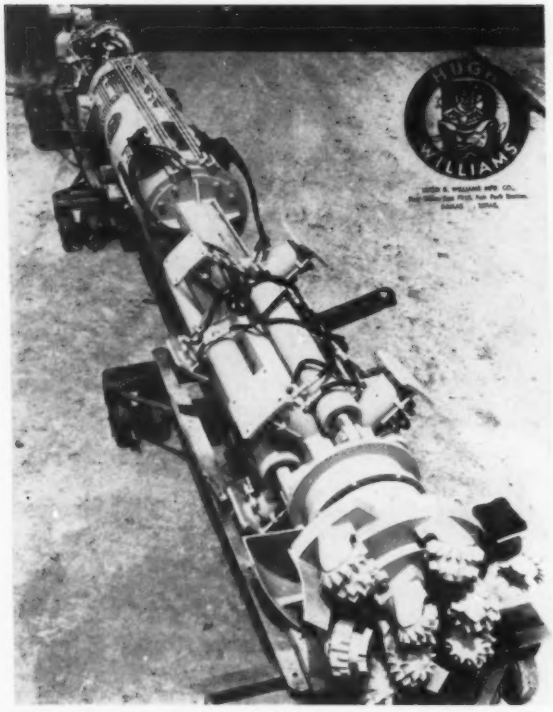
Cutter Head and Auxiliary Equipment . . . The cutter head is drilled to accommodate nine Hughes Tool rolling cutters. Each cutter location is equipped with a port for cutter bearing cooling and lubrication. There are three cutters mounted in the 40-inch-diameter cutter path; three in the 30-inch-diameter cutter path; two in the 20-inch-diameter path; and one in the center or 10-inch-diameter path. Auxiliary equipment for the machine consists of the following:

(a) An International A-180 truck
(b) A single-axle, flat bed trailer
(c) A Gardner-Denver WKE, two-stage air compressor mounted on the truck and driven by the truck engine
(d) A 100-kilowatt, Kato, 440-volt generator driven by a gasoline engine
(e) A reinforced steel cylinder, 40½ inches inside diameter. This cylinder is bolted to the ground and the machine placed inside for starting a hole.
(f) A jack hammer, paving breaker and an assortment of hand tools.

The entire machine and test setup is self-contained and can be readily transported to any reasonable location for a test or demonstration.

Timetable Project Texas Tush Hawg

July 1958	Preliminary design began on a 12-foot diameter, hardrock, tunnel machine.
October 1958	Design was completed and decision made to build a 40-inch prototype machine.
Preliminary Tests	Average drilling rate in soft limestone 12 feet per hour. Average drilling rate in granite 3.5 feet per hour.



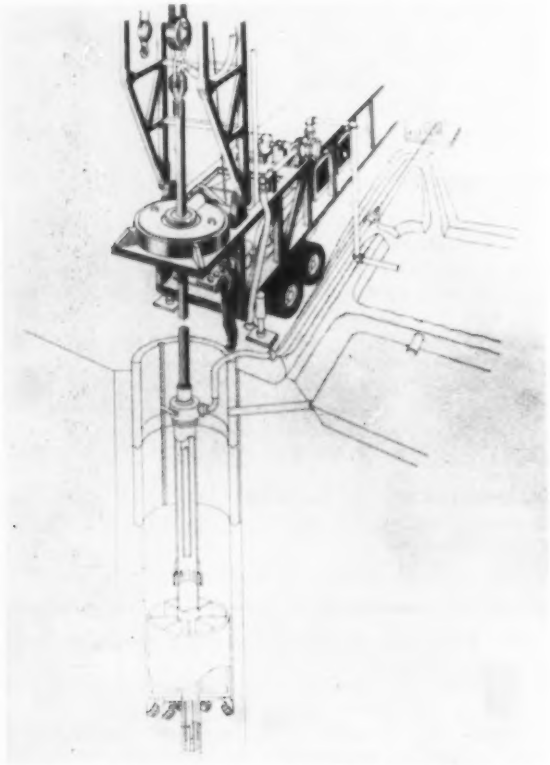
PURPOSE of prototype tunneling machines is to provide data on design and bit life. The unit was designed primarily to drill horizontal holes, but with slight modifications it could also be used to put down vertical holes.

Boring Cycle: Set Jacks

Starting the Hole . . . The initial operation for starting a hole in the high wall of a quarry is to place the 40¾-inch inner diameter reinforced steel cylinder as close to the rock face as possible and bolt it to the ground with rock bolts. Next, the front of the machine is inserted into the reinforced cylinder, the machine leveled with the bottom rear wall jacks, and the remaining jacks set against the cylinder walls. Rotational power is then established and the machine advanced through its 30-inch drilling stroke. After the initial 30 inches of hole are made, the wall jacks are loosened and the outer sliding member is moved forward 30 inches by retracting the four 6-inch thrust cylinders. The machine is then releveled and the procedure repeated until sufficient hole (approximately seven feet) is drilled and all of the wall jacks are set in the drilled hole.

Advancing the Hole . . . The sequence of leveling the machine by the rear bottom wall jacks, setting the other six wall jacks, starting the 75-horsepower electric motor, applying horizontal thrust, starting the screw conveyor and the truck mounted air compressor is repeated before each 30-inch hole advance is made.

The machine can be followed into the hole by the operator. All hydraulic systems operations and all screw conveyor operations can be controlled by use of a small



REVERSE CIRCULATION DRILL RIG capable of 8-foot diameter holes is on drawing boards. Some observers feel that a machine of this principle could be scaled-up to 16 to 20-foot diameter range for shaft sinking problems.

For Deep Shafts: Reverse

Reverse circulation, air-lift drilling systems have gained prominence both in the United States and Europe in the last few years as being the only practical solution to cuttings removal for vertical, large-diameter, rotary drilled holes.

Two U. S. drilling equipment manufacturers build equipment that will drill up to 60-inch-diameter holes to 400-foot depth. One German manufacturer builds equipment that will drill 60-inch holes to 1400 feet.

An agency of the Dutch Government is presently completing the rotary drilling of two 25-foot diameter holes to 1,600 feet by reverse circulation.

An artist's conception of a reverse circulation drilling system that is being considered to drill 8-foot-diameter holes in medium soft formations to 3,000-foot depths is shown at the left. Drilling equipment and accessories similar to that depicted are presently being designed and manufactured by the Hugh B. Williams Manufacturing Company of Dallas, Texas.

Among the very large and unusual items of equipment that have been designed are:

(1) A 1000-foot-long string of J-55, 13¾-inch, 68-pound-per-foot drill pipe equipped with splined tool joints. The splined tool joints are designed to withstand the high torque necessary for large-diameter drilling.

(2) Four, 8-foot-long, 40-inch (outer diameter) by 13¾-inch (inner diameter) lead filled drill collars, each weighing approximately 42,000 pounds.

(3) A drilling swivel designed for 300,000 pounds loading with a 12-inch inner diameter opening through the swivel, wash pipe, and goose neck.

(4) A rotary table designed to transmit 150-horsepower

. . . advance 30 inches . . . retract extended thrust cylinders

portable hand-held switch panel. If the rate of advance is slow it may be necessary to occasionally boost the wall crowd pressure by operating the wall jack solenoid toggle switches. Also it may be desirable to alternately open and close the solenoid valve that actuates the horizontal thrust cylinders. This system can be placed on continuous thrust; but if the rate of advance is not proportional to the fluid volume pumped, the fluid will be by-passed through the pump relief valve and warmed excessively. If the screw conveyor becomes clogged with large cuttings, the reversing switch on the portable switch panel can be actuated in an attempt to free the conveyor. Should the machine become stuck in the hole through failure of the wall jacks to retract, the jacks can be manually released at the solenoid valves and the machine winched out of the hole.

Coming Out of the Hole . . . When it is necessary to come out of the hole to check the machine, change cutters, etc., the operating sequence is as follows:

(a) Stop the 75-horsepower electric motor.
(b) Allow the screw conveyor to operate until a noticeable decrease in cuttings volume is evident; then stop the conveyor.
(c) Stop the truck-mounted air compressor.
(d) Actuate the solenoid valve that provides fast retraction and extension of the four thrust cylinders.
(e) Actuate the three solenoid valves that loosen the eight wall jacks.
(f) Extend the thrust cylinders which, in turn, move the eight wall jacks 30 inches to the rear.
(g) Set the eight wall jacks and retract the thrust cylinders, etc. until the machine is moved to the hole entrance.

The reinforced steel cylinder that is bolted to the ground at the hole entrance can be left in place. The machine can be backed into the cylinder, the wall jacks set, and work can be done on the machine with it fastened in the cylinder to prevent the machine from tipping over.

The design, development, and manufacturing cost of this machine has approximated $38,000.

The 40-inch tunnel driver has been sent to England and leased to the British Coal Board for experimental work.

The 12-foot-diameter tunnel machine is to be powered with three 200-horsepower electric motors. The hydraulic system of this machine is designed to provide 1,500,000 pounds of thrust or drilling force on the 42 cutters mounted on the cutting head. The machine will be 39 feet in length and will weigh approximately 160,000 pounds. The estimated development, design and manufacturing cost is $350,000. Estimated manufacturing and testing time is 12 months.

circulation drilling rigs . . . . . A 44-inch hole now underway

at 5 revolutions per minute with a 96-inch table opening.

(5) A 30-foot-long Kelly with a 12-inch inside diameter.

The drill pipe and drill collars are presently being leased to the Moran Bros. Drilling Co. of Wichita Falls, Texas to drill a 44-inch-diameter, 965-foot-deep, solid granite hole at the Nevada test site of the Atomic Energy Commission. Moran Bros. is employing standard oil field surface equipment on this job (see details below).

The remaining equipment, including a draw works and derrick, should be operational within 10 to 12 months. The entire drilling rig assembly will be mobile. The design, development, and manufacturing cost should approximate $250,000.

It is believed that this equipment can be economically employed to drill mine shafts and missile silo holes in the 16- to 20-foot-diameter range after the five-man drilling crew has tested the machine by drilling 8- to 10-foot-diameter holes and has become familiar with the techniques of large diameter reverse circulation drilling.

The 44-inch test hole being drilled by Moran Bros. Drilling Company for the AEC has interesting overtones for mining. First a 12¼-inch pilot hole was put down to total depth using air as a circulating medium. An 8¾-inch Hughes W7R bit was used to spud and drill the first 40 feet since perfect vertical alignment was required to make the Kelly down. The hole is being widened to 44 inches diameter by a combination reaming-drilling operation.

The rig includes Continental-Emsco GB 350 drawworks with Foster catheads and top drum equipped with one-inch wire for heavy hoisting; two V-85 Climax engines; a Bethlehem 21-inch rotary table on a nine-foot substructure under a 131-foot Lee C. Moore mast.

At the bottom of the drill string, which includes the J-55 pipe, is a 5,000-pound steel plate type bit body with individual rolling shaft cutters. This will open the hole to full diameter in one operation. The bit body consists of a Hughes Tri-Cone bit as stinger at the center. Fanning out from the stinger are two rolling shaft cutters in the first 20-inch path; three cutters in the 30-inch path; three cutters each in the 40- and 44-inch paths. Preliminary estimates were that this reamer bit would drill 22 feet per set of cutters. The four lead-filled drill collars mentioned above are positioned just above the reamer bit.

To the middle of October, the 12¼-inch pilot hole had been finished to full depth of 990 feet and it deviated from vertical less than 0.5°. An estimated 40 days will be required to open the hole to 44 inches.

A concept of a 20-foot-diameter, shaft-boring machine capable of drilling a 20-foot-diameter hole to a depth of 150 feet is outlined in the Production Equipment Preview section of this issue.

The author is indebted to the Hugh B. Williams Manufacturing Company, the Zeni-McKinney-Williams Corporation, and the Hughes Tool Company for providing the material and time for this paper.

END

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(2) Hughes Tool Company, "Rotary Drilling Bits," 1959
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Uranium Assaying by Simple Color Comparison

Gives Mill Operators Quick and Accurate Mill Control of Ion Exchange Tailing to Prevent Solution Loss

A fast, inexpensive, and sufficiently accurate visual bead test has been developed to determine the U_3O_8 content of ion exchange tailing in a uranium mill.

It is expensive to staff and operate a standard fluorimetric laboratory to maintain mill control of tailing. The time necessary to make such a determination is long enough that an appreciable uranium loss to tailing can result while waiting assay results.

Management at the Monticello, Utah mill operated by National Lead Company, Inc. for the United States Atomic Energy Commission has developed this quick-on-the-spot assaying method for mill operators who have no knowledge of chemistry. For weak solutions, 0.01 to 0.05 grams of U_3O_8 per liter, the method is accurate enough for mill control.

In order to bring about reproducible results, the most important factor is the standardization of conditions. That is, the samples should be fused for the same length of time and under the same conditions as the standards. Fusion over a reducing flame decreases the fluorescence by as much as 20 percent. Cooling slowly increases fluorescence. At least one minute should be allowed to accustom the reader's eyes to darkness after entering the dark room. Goggles with filter to transmit 520-640 mu radiation, if used, increase reliability. "Tergitol" is used to decrease surface tension by giving a smaller and more consistent drop on the pellet.

In the mill it was found that there was considerable quenching of fluorescence by contaminants in solution. This quenching was caused by iron, chromium, copper, calcium, silicon, vanadium, aluminum, and sulfates; while columbium, tantalum, and other rare elements cause the emitted fluorescent light to increase.

Therefore, the standards had to be made using the same solutions that are used in the bead test. These standards are prepared with values of 0.005, 0.01, 0.02, 0.03, 0.04, and 0.05 grams U_3O_8 per liter. The use of a few drops of concentrated nitric acid added at this point tends to alleviate the quenching difficulty. The standard beads become contaminated from yellow cake and dust and lose their fluorescence so that new standard beads are necessary periodically.

When the bead tests were inaugurated, it was hoped that the accuracy would be within $\mp$ 0.01 grams U_3O_8 per liter. However, the operators have been able to interpolate the value between each standard and give a better than average result when com-

Three Key Steps in Making Visual Bead Test for Uranium

How the Bead Test Is Made

To the tailing sample add two or three drops of Separan, shake, and let settle. Pour about 25 milliliters of the sample into dropper bottle. Then add six drops of concentrated nitric acid, and one drop of "Tergitol," and shake the bottle.

A pellet of flux is placed in the depression of a clean spot plate. A clean platinum loop is heated to redness and the pellet is scooped upon the hot wire. Loosen the top of dropper bottle slightly and turn to "off" position. Tip up and let half a dozen drops fall; then, with the flux tablet directly under the glass dropper, catch a drop just as it leaves the dropper.

Dry tablet above the flame, being careful not to dry it too fast. When the flux has become white again, melt in the upper portion of the blue flame until bead is clear.

Let bead cool and then read. Compare the sample with a set of standards under ultra-violet light. Standards are prepared in the same manner as above and kept under a plastic bell jar.

PREPARED TAILING SAMPLE dropped directly on flux pellet.

These Comparisons Prove Accuracy

Month	Visual Bead	Fluorimetric Assaying
January	0.049*	0.055
February	0.022	0.021
March	0.030	0.030
April	0.036	0.034
May	0.041	0.042
June	0.032	0.032

*Grams U_3O_8 per liter.

paring the bead test with the fluorimetric method of analysis. In practice, the operators consistently estimate results within $\mp$ 0.003 of the fluorimetric results.

When the concentration of U_3O_8 exceeds 0.05 grams U_3O_8 per liter, the beads cannot be compared with the standards, even though higher standards could be prepared. This limit is due to the difference in fluorescence which is not sufficiently apparent to the human eye so as to make an accurate estimate of the value.

The first platinum loops were made out of stock wire by the analytical laboratory and set into glass tubing for use as a holder. Duplicating the loop diameters and the shaking done to remove the flux when cleaning the loop created a condition of high loss of platinum. Then, prepared platinum inoculating loops were purchased and small metal chucks to hold the wire.

The prepared platinum loops are holding up under usage. The metal chucks are failing because they freeze and cannot be broken loose for installation of a new loop. Forcing the chuck to open results in breaking the holder just below the chuck and subsequent replacement is necessary.

When the platinum loop is badly contaminated, it is cleaned by a mixture of nitric and sulphuric acid followed by a water rinse.

All glassware should be washed with a cleaner such as "Alconox," having no background of fluorescence. Dust containing any form of uranium should be avoided and the flux should be checked often for the contamination by running a blank at least once a shift.

Thanks are given to C. K. Coates, manager; Edward D. Dickerman, technical supervisor; and William Halls, chief chemist, for preparing this article and releasing the information to the metallurgical industry by publication in MINING WORLD. END.

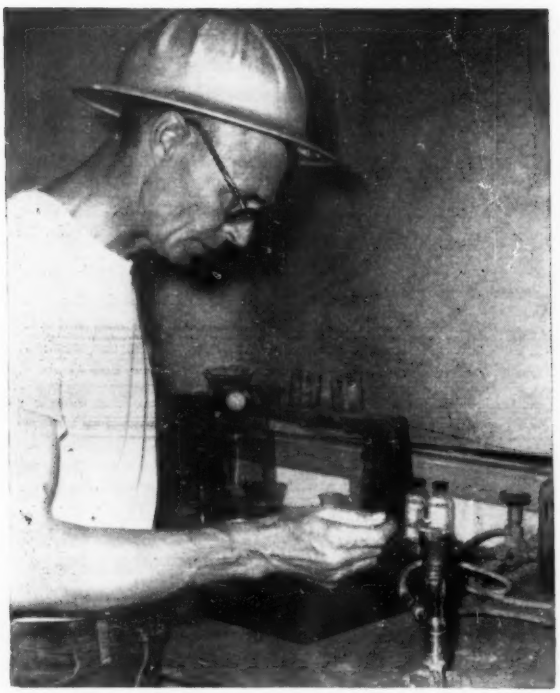
Equipment Required To Make Tests

Apparatus:

1 burner, blast high temperature.
1 dozen platinum inoculating loops, about 3 or 4 mm in diameter.
1 ultra-violet light source.
1 dark room approximately 4 feet wide, 3 feet deep and 7 feet high.
2 plastic bell jars.
1 dozen metal holders for platinum inoculating loops.
2 stands or wooden blocks with sufficient holes in each to handle six of the platinum holders and small enough to fit under a bell jar.
1 spot plate.
1 pellet maker (adjustable)
12 dropper bottles 100 mls capacity. (glass top)

Reagents:

"Alconox"
Sodium fluoride, 98 percent, mixed with lithium fluoride, 2 percent. (Flux).
1 to 1 mixture of sulfuric and nitric acids. (cleaning solution for platinum loops)
Separan, 1.0 percent.
Concentrated H_2SO_4.
Concentrated HNO_3.
Concentrated "Tergitol" or other surface tension reducer.



MELTING PELLET in flame produces fluorescent bead.

MINERALIGHT comparison with standard beads gives assay.

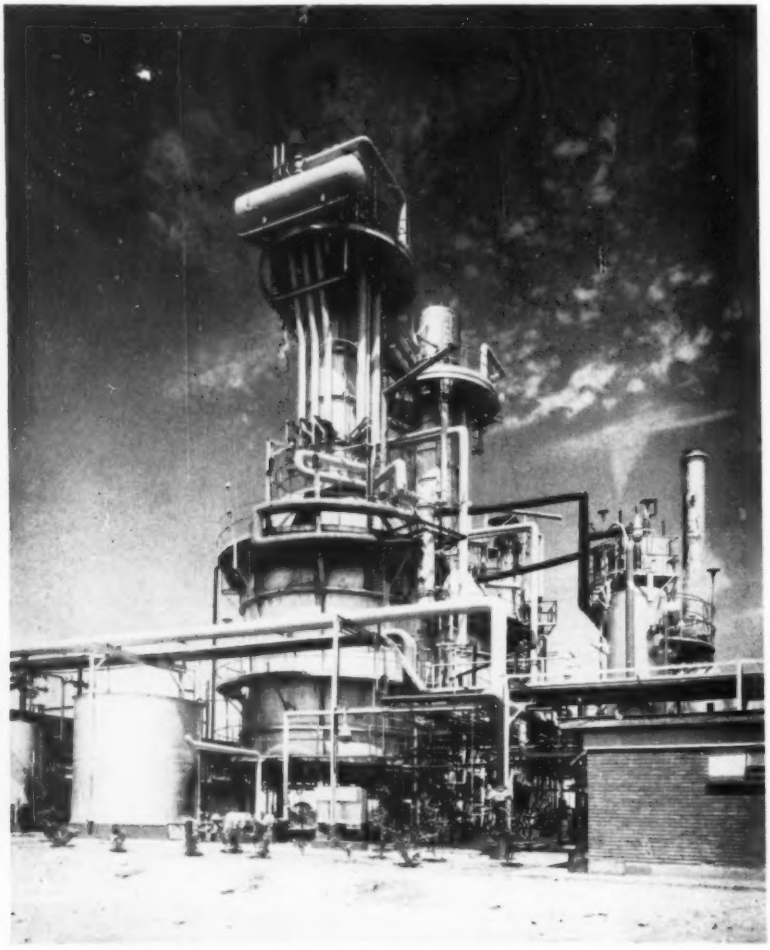
A Report from Mexico

NEW SPONGE IRON PLANT

Reduces Iron Ore with Reformed Natural Gas and . . . Demonstrates Commercial Success of HyL Process

Built for an estimated $45 per annual ton of capacity, the 200 ton-per-day direct reduction plant of Hojalata y Lamina, S.A. at Monterrey, Mexico, unlocks oxygen from high-grade iron ores and turns out a porous product containing 90 percent iron. The newly developed Hojalata y Lamina (HyL) process has been so successful that M. W. Kellogg Company in New York is currently designing and constructing a second 500 ton-per-day plant for the Mexican steel producer.

M. W. Kellogg engineers, who had a hand in developing the HyL process, predict a wide potential application for the previously untried direct reduction technique. They look on HyL treatment as a new tool for expansion of steel industries in every nation. They point out that capital investment for HyL is far less than for blast furnace facilities—that abundant supplies of coking coal are not required—that perhaps integration of ore production and reduction by HyL offers a way to achieve economies.



TWIN GAS REFORMING FURNACES react natural gas with steam to produce the reducing gas used at the plant. M. W. Kellogg has been named exclusive world-wide licensing agent for the HyL process.

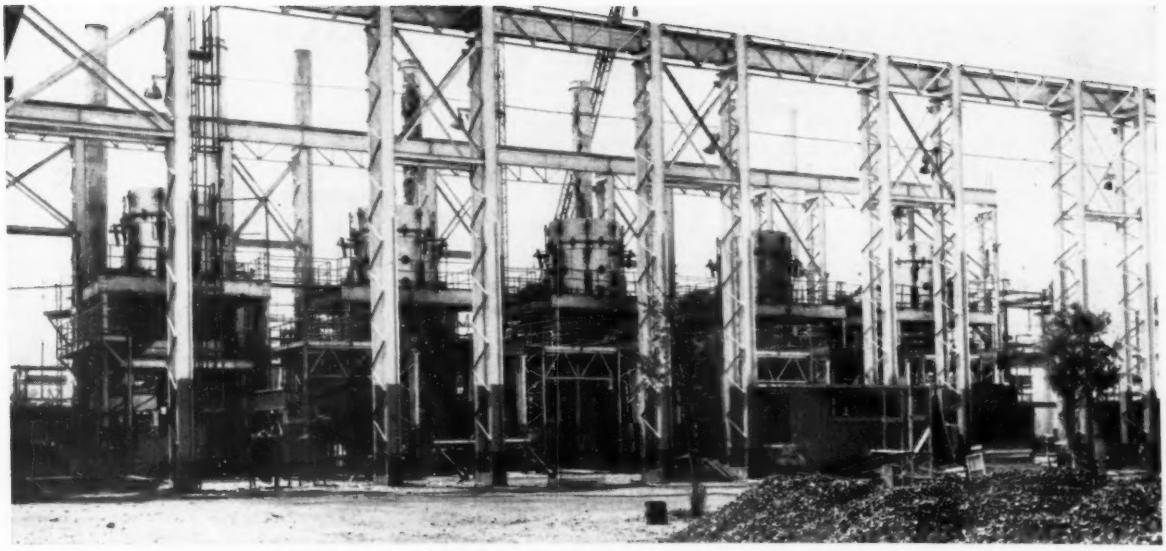
1. Reactors Are

HyL is a batch process in which ore is directly reduced in a reactor by reformed natural gas. The gas flows into the reactor at the top, is blown through the ore for a period of about four hours, and leaves from the bottom of the reactor to be used as fuel for the furnaces and preheaters of the plant. The main sections of Hojalata y Lamina's present plant consist of a pair of Kellogg gas-reforming furnaces in which the reducing medium is prepared, and a row of five equal-sized reactors in which the actual ore reduction takes place.

Each reduction reactor is designed in two sections with a stationary flanged head at the top to which the inlet gas connections remain permanently attached. The lower section, also flanged, moves on wheels to discharge points where the cargo of hot sponge iron is dumped into a transporting hopper by tilting the reactor. Each reactor is charged with 13 long tons of ore.

At any given time during operation of the plant, two of the reactors are in a primary position—receiving reducing gas for the first two-hour period; two are in secondary position—receiving reducing gas which has been quenched and reheated to reduce the ore for another two hours; and a fifth reactor is off-stream being unloaded and loaded. In the continuous, five-hour cycle, a reactor is dumped every hour.

Natural gas which has passed



FIVE REACTORS are rotated through a loading-reducing-dumping-standby cycle at the Hojalata y Lumina plant.

Paired for Sequencing of Gas Flow Through Reducing Cycle

through a preheating coil in the reforming furnaces, and then through a desulfurizing drum, flows next through the reformer coils where it combines with steam, producing hydrogen and carbon monoxide in the presence of a catalyst. After it leaves the reformer, the gas is quenched in a scrubbing tower and excess water is removed. Now cool and dry, the reformed natural gas is preheated in tubular furnaces of special design. It is now "primary" gas—ready to reduce ore in the two reactors resting in the primary position.

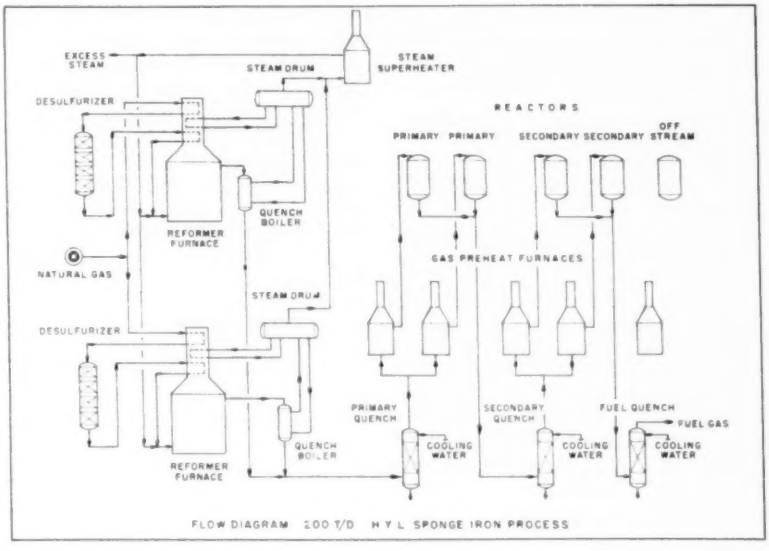
After passing through the primary reactors, the gas is water quenched in a secondary quench tower, reheated, and passed through two secondary reactors for another two-hour period. These secondary reactors have been filled with fresh ore.

Each reactor in the Mexican plant is directly connected to its own reduction-gas preheater and its own quench zone. Remotely operated valves and a cycle control system with safety interlocks minimize operating hazards; the entire reduction process for all five reactors is controlled from a central control house. Dumping and loading are directed from an outdoor platform.

The first step in the operation of a single reactor involves charging the ore to the lower part of the reactor. This section is then moved directly under the upper section; hydraulically raised; and then sealed to the flanged top section. By opening a valve, the reactor is purged to the blowdown system with natural gas. After the blowdown valve is closed, the reactor is put under pressure for ore reduction.

In actual operations, the reactor is in the secondary position when an outlet valve is opened to release the gas from the reactor to the fuel gas quench tower and an inlet valve is opened to receive gas from the secondary quench tower. Next, primary gas enters the reactor, reduces the ore for two more hours, then flows out to the secondary quench tower.

When the reactor is cut-off from its gas flow and depressurized to a blowdown system, it contains hot sponge iron. At this point natural gas is introduced to add carbon to the sponge. The carburizing purge takes about two to three minutes, after which the reactor is allowed to depressurize and the blowdown valve is closed. The reactor closure mechanism is released. The bottom of the reactor is lowered and moved out to discharge its sponge iron into an open-top hopper which also serves as a charging bucket for the electric furnaces.



2. The Natural Gas Requirements Are 21,000 Cubic Feet

In essence, the HyL process does four things to the ore: it drives-off all water; it eliminates CO_2 from carbonates; it removes a high percentage of oxygen and a high percentage of sulfur. It also deposits carbon in the sponge iron. The accompanying table gives a typical analysis of the finished sponge iron at different levels in the reactor bed.

The water and calcining losses are removed from the ore during the heating period when reactors are in the secondary position. Since excess heat is available at this stage, the process is not penalized by high moisture content of the ore; in fact, the plant has operated for extended periods with ores that were dripping wet.

Oxygen removal may be completed to almost any degree desired up to about 95 percent. The exact percentage will be a function of the gas quantity, the cycle time, and the temperature in the reactor. Various ores have different characteristics which will set the economical limit for the maximum percent reduction. Sintered ores tested in the plant have been reduced to essentially the same percent reduction as Mexican ores.

The 200 ton-per-day plant removes sulfur from the iron ore as hydrogen sulfide. It gives a product containing less than 0.06 percent by weight sulfur, providing the sulfur content of the ore is less than 0.5 percent by weight. The plant is said to have a capacity to remove much more sulfur but will not give a sponge of the low sulfur content required for making steel of a 0.04 percent sulfur content. Where higher sulfur in the steel is acceptable, the sulfur content of the ore charged to the unit may be higher without necessitating reducing sulfur in the steelmaking process. The steelmaking furnaces must be prepared to reduce phosphorus if a high-phosphorus ore is used since the HyL process itself does not facilitate phosphorus removal.

Sponge Iron Analyses

Item	Sample Location from Top Down				
	0-1 Feet	1-2 Feet	2-3 Feet	3-4 Feet	4-5 Feet
Metallic Iron	90.0	86.8	79.4	73.0	64.0
Total Iron	93.4	93.0	90.8	89.8	87.4
% Reduction	96.3	93.3	87.4	81.3	73.2
Carbon	1.3	1.36	1.64	1.62	1.34
Sulfur	0.06	0.02	0.04	0.03	0.02
Insolubles	3.1	3.5	3.6	3.5	3.5
Average % Reduction by Analysis				86.2	
Calculated % Reduction by Wt. Loss				96.0	
Calculated % Reduction by Gas Atom Balance				87.4	

Characteristics of Feed

Hojalata y Lamina's plant at Monterrey is supplied with rich ores from Durango and Pihuamo. The exact ore composition varies slightly, of course, but a Pihuamo ore sample provides a fair average. It contains about 65 percent iron (20 percent in magnetite and

3. Sponge Iron and Scrap Charged to Lectromelt Furnaces . . .

The electric furnace shop near the Hojalata y Lamina sponge-iron plant consists of one 45-ton and one 75-ton Lectromelt furnace. These furnaces have been operating on a charge of 50 percent sponge and 50 percent scrap iron. When more sponge iron is available from the 500 ton-per-day plant now under construction, Hojalata y Lamina expects to raise the furnace charge to 75 percent sponge iron. A new 75-ton furnace has recently been installed.

The melting technique now employed at Monterrey is as follows: a small quantity of scrap is first charged on the bottom of the furnace and all sponge iron is then charged high along the walls, and low in the center. Electrodes are lowered into this center depression. Some 30 percent of the power is applied during the first three to five minutes. More current is used as the temperature rises and as the charge begins to melt from the bottom up. After the melt, which requires approximately the same time as an all-scrap charge, an acid slag is flushed from the furnace and lime is added. Normal electric furnace operations then proceed.

From Sponge to Steel

The metallic yield of the steel produced at the Hojalata y Lamina facilities is essentially the same, whether scrap or sponge iron is used. Tonnage of steel produced per heat is also comparable. On the 75-ton arc furnace, an average of 4½ heats per 24-hour day were made on the all-scrap charge, and the same number are now being made on the 50 percent sponge—50 percent scrap charge. The plant's steel production capacity thus has remained on the order of 300,000 net tons of ingots per year. When the new 500 ton-per-day sponge iron plant is in operation, of course, total tonnage of production will increase.

In practice, the amount of power consumed in melting sponge at Hojalata y Lamina is only slightly over that required for melting 100 percent scrap iron. Furthermore, power requirements for melting sponge are much more uniform. When sponge iron is charged, voids are reduced, thus avoiding energy radiation to the refractory linings of the furnaces.

An electric furnace consultant to HyL and Kellogg recently made test melts in which the sponge iron content of the furnace charge was varied. The following results were obtained in a 20,000-kva Letromelt furnace with a total charge of 70 metric tons.

Percent Sponge in Charge	Time To Melt (Minutes)	Melting Rate Tons/Hr.
50%	151	27.7
70%	174	24.2
100%	180	23.0

How Steel Is Used

Hojalata y Lamina is using the steel produced from its HyL sponge for producing deep-drawn steel products, such as cooking utensils and electric resistance welded pipe. The steel is of high-quality and is directly comparable in physical and chemical specifications to the rimming steels produced in the United States.

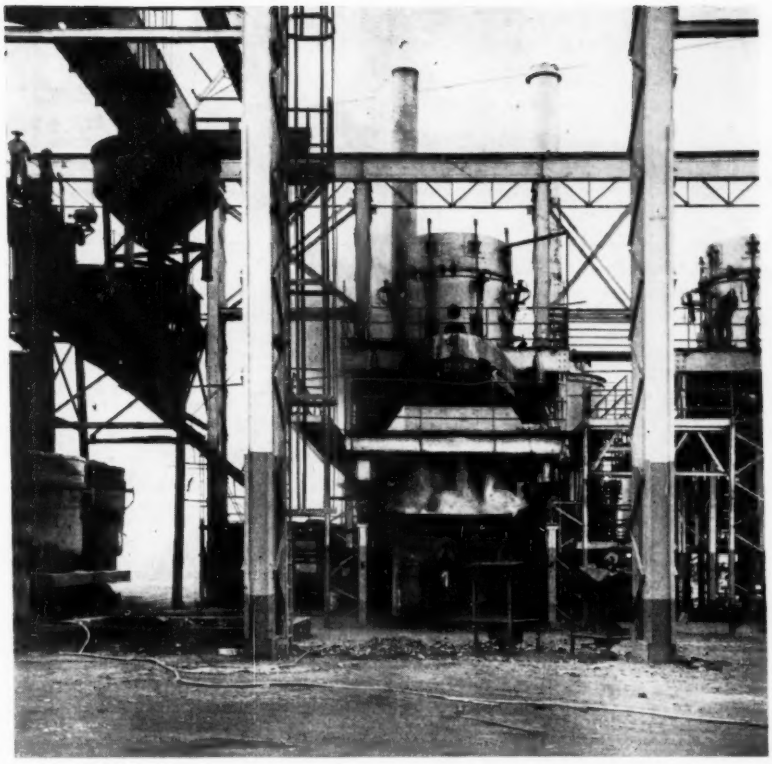
One of the reasons why Hojalata y

Per Ton of Sponge

45 percent in hematite). Other high-iron ores in which 40 percent of the iron appears as magnetite have also been successfully reduced in the Mexican plant. The sponge iron reduction for both types proved essentially the same. Tests are now in progress in processing ores of lower iron content.

Before it is dumped in the reactors, the Mexican ore is crushed and screened to sizes ranging from ¼ to 1½ inches. Up to 20 percent of the ore charged is minus-¼-inch. A higher percentage of fines would present proper passage of the reducing gas through the ore, while a greater quantity of larger lumps would not be as amenable to rapid reduction. A study of agglomerating fine concentrates is now underway. Preliminary results indicate a low-cost pelletizing plant may be possible.

An average analysis of the hydrogen-rich reducing gas is as follows: 6.6 percent CO_2, 16.3 percent CO, 73.1 percent H_2, and 4.0 percent CH_4. About 21,000 net-cubic-feet of natural gas and some 70 kva of power are currently required to produce one net ton of sponge iron in the 200 ton-per-day plant.



HOT CARGO of sponge iron has just been dumped from this reactor. HyL plants can be installed at mines along with briquetting operations so that companies could sell metallics rather than ore to steel plants.

. . . Flexibility, Low Cost Are Built-In Advantages of Process

Lamina is enthusiastic about melting sponge iron as compared to scrap is the virtual elimination of difficulties formerly encountered in keeping residuals low. With a 100 percent scrap-iron charge to the electric furnaces, copper and nickel residuals were particularly difficult to maintain at low levels. Now, with a 50 percent sponge iron charge heats which are off-specification have greatly decreased.

Economics of HyL Process

Potential future applications of the HyL process, available only through M. W. Kellogg Company as exclusive world-wide licensing agent, will stem largely from cost considerations or from the inherent flexibility of the process. The low capital investment required for each annual ton of the initial Hojalata y Lamina plant capacity has already been cited. It is said to be perhaps the lowest investment cost required for any of the seven known iron ore reduction processes now being commercially used in different parts of the world. For example, the initial cost of a HyL plant is estimated to be at least 50 percent less than the average current cost of building blast furnace facilities, even though the latter can reduce ore in much greater quantities.

While operating cost for the present 200-ton-per-day plant are already low, estimated costs for larger tonnage HyL plants are even lower. At the present plant, only eight operating personnel per shift are required for the facilities. This is reported to be considerably less manpower than in comparable plants using other ore reduction methods.

Nations which previously could neither afford the huge capital investment required for even minimum-size blast furnaces, nor consume, nor competitively sell the larger production of blast furnaces, now have a new opportunity to establish a profitable steel-making industry or expand an existing one.

Other Advantages

The HyL process also offers certain transportation economies. Purification of ore right at the mine appears a logical development for the HyL process. By adding a briquetting operation to a HyL sponge iron plant located near the mine, companies could sell their products as high quality metallics and realize a higher price than could be derived from sale of ore. The latter step would reduce transportation costs since metal briquettes with more iron units would be shipped. The problems, logistics and transportation costs of raw materials for a steel industry would be reduced or simplified.

It is clear that lower grade magnetite ores that have first been beneficiated could be economically reduced to sponge iron in HyL facilities, while the overall economic advantage of HyL reduction compared to the blast furnace would still pertain. Similarly, the inherent economic advantages of the HyL reduction method remain intact if lower grade hematite ores were first processed in a HyL plant and then beneficiated. Whichever way it is viewed, HyL appears as a bright and welcome star on the steel horizon.

PRODUCTION EQUIPMENT PREVIEW

For data on any item on next three pages use the inquiry card opposite page 34

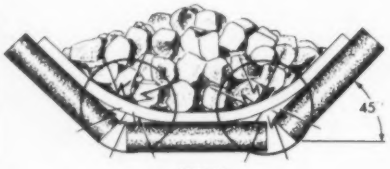


FIGURE 1

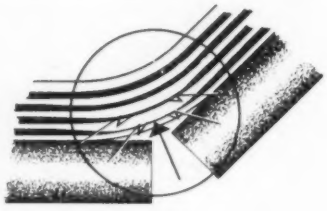


FIGURE 2

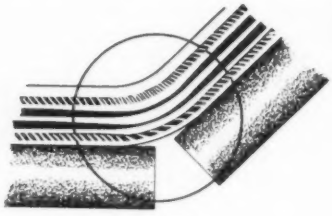


FIGURE 3

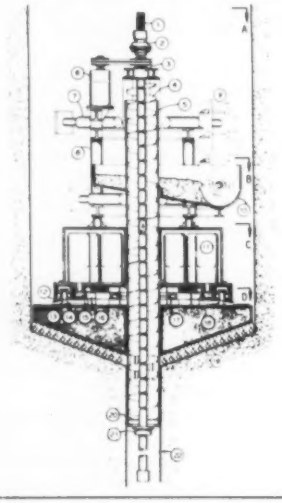
Heavy Duty Conveyor Belt Travels over 45° Idlers . . . Carry Bigger Loads

The heavier carrying capacity of conveyor belts traveling over 45° idlers has long been recognized, but most conventional slab belts are difficult to train under heavy load and are subject to ply and cover separation.

Raybestos Manhattan, Inc. has developed a compensated belt which it will guarantee against ply or cover separation at the idler hinge line when used with troughing idler up to 45° design. The guarantee is said to be good for the life of the belt.

The above figures illustrate the principles involved. Ply separation commonly occurs at the hinge line where belt bends between bottom centering roll and the side rollers (Figure 1). In a conventional slab belt all plies are of the same fabric and have the same characteristics. When the belt takes a sharp bend the bottom outer ply on the radius gets most of the tension, while the top outer ply may be in compression (Figure 2). The fatigue caused by these stresses lead to failure. New Ray-Man belt (Figure 3) shows compensated construction so that outer ply stretches as the inner ply contracts under both lateral and longitudinal flexing.

Raybestos-Manhattan claims the new belts with 45° idler design offers 25 percent more carrying capacity for ores. Circle No. 49.



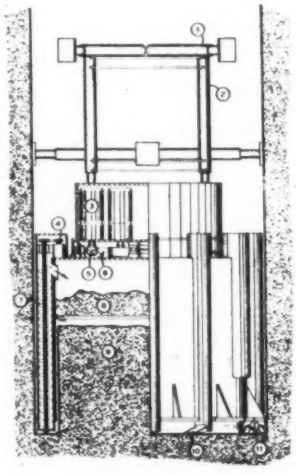
Legend for left drawing

1. MUD RETURN HOSE
2. SWIVEL
3. BEARING
4. SCREW CONVEYOR - 26'
5. SCREW CONVEYOR TUBE
6. SCREW CONVEYOR MOTOR - 25HP
7. ANCHOR JACKS - 8-12' TOTAL WALL PRESSURE - 1,800,000 LBS
8. THRUST JACKS - 4-16' TOTAL THRUST - 1,800,000 LBS
9. BUCKET LIFT
10. CUTTINGS TRANSFER BASKET
11. 12 - 75HP DRIVE MOTORS - 1750RPM
12. ROLLER - OUTER BEARING
13. SEAL
14. RAIL
15. PINION GEAR - 12"PD - 40RPM
16. RING GEAR - 120"PD
17. INNER BEARING
18. CUTTER HEAD - 4RPM FILLED WITH REMOVABLE WEIGHT
19. CUTTERS
20. CONVEYOR BOTTOM PLATE
21. BEARING
22. PILOT HOLE

TOTAL WEIGHT OF MACHINE WITHOUT SHOT - 120,000 LBS.
WEIGHT OF SHOT - 150,000 LBS.
TOTAL DRILLING FORCE - 1,800,000 + 270,000 = 1,970,000 LBS.

Legend for right drawing

1. ANCHOR JACKS - 8-8" TOTAL WALL PRESSURE - 444,000 LBS.
2. THRUST JACKS - 4-8" TOTAL THRUST - 400,000 LBS.
3. 6 - 40HP DRIVE MOTORS - 240 HP 1750 RPM - 440 VOLT GEAR REDUCTION UNITS - 1750RPM TO 40 RPM
4. SCREW CONVEYOR MOTORS - 12 - 3HP EACH
5. PINION GEAR - 12"PD - 40 RPM
6. RING GEAR - 120" PD
7. SCREW CONVEYOR
8. CUTTINGS BASKET
9. CORE
10. CUTTINGS SCOOP
11. CUTTERS - CUT 10" KERF



New Concepts: large diameter drills for shaft sinking projects

Concepts for two machines for boring 20-foot diameter holes were shown by James H. Allen, chief engineer, Hugh B. Williams Manufacturing Company, at the ninth annual drilling symposium held at Pennsylvania State University. At left (above) is the conception of a drill similar to the Zeni-McKinney-Williams machine that might be employed to drill 20-foot diameter holes, full width, to a depth of 150 feet in medium hard formations.

Mr. Williams states that the full hole machine could be developed and manufactured for $375,000 and would have a drilling rate of six to 10 feet-per-hour in medium hard formations.

The concept of a 20-foot diameter core drilling machine for hard formations is shown at right above. Estimated design and development cost for this unit is about $200,000. Mr. Williams believes that private industry would be willing to develop such machines at its own expense if given some assurance of specific construction programs. Circle No. 44.

Fuel Cell: New Source of Electric Power

Electricity produced by 1,008 fuel cells powers this experimental tractor (3,000-pound drawbar pull) made by Allis Chalmers Manufacturing Company.

The fuel cell instantaneously converts chemical energy to DC electrical energy. The chemical energy is in a mixture of fuel gases—largely propane. The mixture of fuel gases is fed to the anode electrode of the fuel cell and absorbed by the catalyst on the electrode. It is activated there and reacts in the electrolyte.

Meantime, oxygen is absorbed at the cathode electrode and it reacts with an electron from the external circuit and with the electrolyte, thus reforming the ion which was used up at the anode electrode.

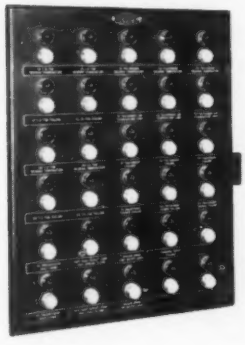
Allis Chalmers engineers see in the fuel cell a valuable energy conversion method through use of off-peak generator facilities to produce hydrogen and oxygen which can be stored, transported and utilized at will in fuel cells. Low voltage constant loads such as electrolytic refining of metals could make use of this type of energy. Circle No. 60.

Link Belt to Represent Orenstein Koppel in U.S. and Canada

A new surge of interest has been noted in the application of bucket wheel excavators following the announcement that Orenstein-Koppel und Lubecker Maschinenbau of West Germany has entered into an agreement with Link Belt Company. Under terms of the agreement, Link Belt will represent the German firm with regard to the LMG bucket wheel excavator and accessory open pit mining equipment in the United States and Canada.

Bucket wheel excavators have been used extensively in the stripping and development of brown coal deposits in Germany where they have been coupled with high-speed belt conveyors and stackers for continuous removal of material. In recent years several units have been put into operation in African diamond and copper properties (see Nchanga Bucket Wheel Stripping **Mining World** February 1959), in India and in other parts of the world.

Within the past two years bucket wheel excavators have received serious consideration for major stripping projects involving copper and other non-metallic minerals in the southwestern part of the United States. For information on equipment and conveyor applications Circle No. 61.

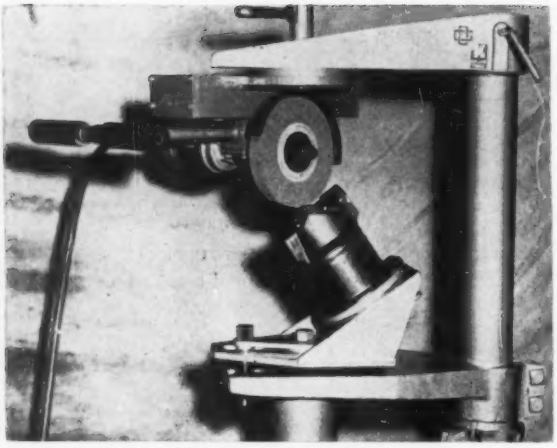


Annunciator Signals Its Own or Outside Failure

New fail-safe unit utilizes two lamps per annunciator point. A red lamp indicates field abnormality; the white trouble lamp signals annunciator component failure and also doubles as a running lamp during such failure. The model 50FS can pay for itself by saving operator guesswork in checking the system controlled when no corrective action is required. Made by Panellit, Inc., the model 50FS also provides flexibility of optional lock-in, remote alarm and auxiliary contacts, a flashing alert signifying field abnormalities, and a trouble lamp test feature with pushbutton. **Circle No. 47.**

Improved Motor Insulation

A new supported silicone rubber insulation, developed by General Electric Company, represents a major breakthrough because it combines the superior dielectric and sealing properties of silicone rubber with a greatly improved mechanical strength state company engineers. The new Polyseal insulation will permit the application of random and form-wound motors up to 5,000 horsepower in many installations previously limited to totally enclosed and more costly motors. The Polyseal system used in form wound motors consists of silicone rubber-impregnated dacron and glass tape wrapped around each coil in several layers. Circle No. 18.



New Grinder For Large Rock Bits

A self contained unit designed to accurately sharpen and finish all surfaces of the larger detachable rock bits has been developed by Gardner Denver Company. It was made for use with G-D 600, 700 and 1000 series threads and Mole Dril bits, but it also may be used for small sizes such as Timken A, D and K. The machine grinds either Cross or X bits easily with a fast, simple interchange to fixture for gauge grinding. Designated model G6, the machine aligns itself as the detent pin locks in place for each grinding operation of the bit face. Circle No. 51.

Pressurized Trailer for Dry Solids

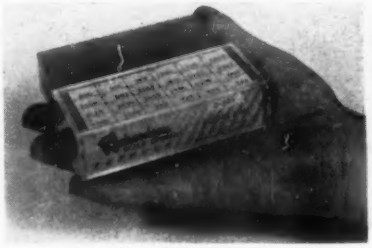
New dry cargo transports can haul and pneumatically discharge at least 48 pulverized materials, according to Delta Tank Manufacturing Co., Inc. The trailers are filled through weather-proof top openings. Discharge power is provided by low-pressure blowers; tank is emptied at rates up to 37½ tons-per-hour (unloading speed varies with specific weight of material). The solids are then air-conveyed through 4-inch flexible hose. List of produce handled shows many chemicals and ores, including high specific gravity items such as barite, chromite, zinc oxides, etc. Circle No. 52.

New Capsule Electronically and Automatically Controls Proportioning

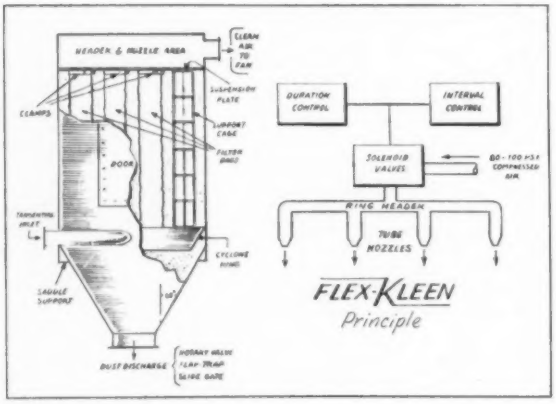
A new formula capsule said to eliminate manual errors in blending and proportioning has been introduced by Richardson Scale Company. The hand-held instrument on the left is the capsule. It is integrated with the Richardson Select-O-Weigh proportioning panel.

The pocket-size control consists of a network of miniature electronic components sealed in a shatter proof protective cover. The capsule is claimed to be capable of programming the sequence and weighing of up to 24 solid and/or liquid ingredients for a single system. Each ingredient can be pre-set in the laboratory by a simple set-screw adjustment on the capsule. The manufacturer states that presetting of the capsule takes only a matter of minutes.

By inserting the capsule into a portable



Capsule Formulator (see photo on right) and moving the indicator switch to position one, the desired weight of the first ingredient can be set on the formulator dial. Proportioning is assured by adjustment on a set screw on the capsule until the meter is brought into balance. Formula identification is made by means of a removable formula card that slips into place on top edge of the capsule. After pre-set unit is inserted into the receiving slot of a Select-O-Weight panel, operator can set the automatic system into operation. Circle No. 45.



Dust Collector Has No Moving Parts

Features listed by Flex Kleen Corp. for a new dust collector are constant flow and pressure drop and automatic filter tube cleaning.

The dust collector is claimed to be especially effective for use in heavy mineral processing industries. It can be suspended from the ceiling or floor-mounted according to reports. It is said to be compact in design, simple to install, and available in six standard sizes with 2,000 to 12,000 cubic-feet-per-minute capacity. Flex Kleen reports that special applications are engineered to suit individual requirements.

Gas stream enters the collector through a tangential ring which helps drop heavier particles before they reach filter tubes where the lighter particles are caught. The filter tubes are periodically flexed by sharp bursts of air to shake the load and clean the tubes. Shake off action is adjustable. Circle No. 59.

pushbutton. Circle No. 47.

several layers. Circle No. 18.

MORE NEW EQUIPMENT . . . AND NEW LITERATURE

TRACK ADJUSTMENT on three Caterpillar crawlers has been improved with the introduction of hydraulic adjusters on the D-4, D-6 and No. 977 Traxcavator models. Circle No. 4.

DIESEL ENGINE that is naturally aspirated and in the 160-horsepower class has been introduced by Cummins Engine Company. Circle No. 5.

BOTTOM DUMP TRAILER with 35-ton capacity has been developed by Athey Products Corporation for use with the Caterpillar DW 21 tractor. Circle No. 6.

ELECTROSTATIC SEPARATOR has been developed for dry concentration by Dings Magnetic Separator Company. Both low intensity and high intensity models are available in capacities up to six tons-per-hour for a single unit. Circle No. 7.

NEW 80-TON HAULER has been developed by Letourneau-Westinghouse Company. Unit consists of 100 cubic-yard trailer and is powered by a tire-mounted tractor containing a 450-horsepower Cummins V-12 Diesel engine. Circle No. 8.

ONE USE CARBIDE BIT for use with dust collecting type stopers, air legs or sinkers has been developed by Le Roi Division, Westinghouse Air Brake Company. Three sizes are available from 1⅜ to 1⅝ inches. Circle No. 9

DRILL MAST on the new Thor Power Tool Company, self-propelled, rock drill can be positioned by means of "push-button" hydraulic power, according to company announcement. Circle No. 10.

TRACTOR SHOVEL mounted on rubber tires and featuring four wheel drive has been developed by Frank G. Hough Company. The model H-50 is said to have a 5,000 pound carrying capacity. Circle No. 11.

PROTECTIVE COATING combines rust-inhibitive primer properties with chemical resistance of epoxy coatings reports Prufcoat Laboratories Inc. Compound is brushed or sprayed on surfaces. Circle No. 42.

SURPLUS EQUIPMENT and hundreds of newly manufactured items are cataloged in a 60-page bulletin by Groban Supply Company. Special sections deal with hydraulic equipment, and with machinery in the construction, Diesel and automotive fields. Circle No. 27.

HYDRAULIC HOSE GUIDE has been prepared by Hydraulics Inc. The 16-page catalog outlines low to high pressure hose specifications for assemblies on mining equipment and contains information on permanent and re-useable types of couplings. Circle No. 12.

PVC PLASTIC PIPE can now be supplied in 8, 10 and 12-inch diameters, according to A. M. Byers Company. Two types are available—one particularly suited for corrosive applications and one with high impact resistance. Circle No. 23.

CENTRIFUGAL COMPRESSOR: New engineering literature is available from Allis Chalmers on three styles of single-stage scroll casing compressors. B style has applications for mine ventilation. Circle No. 25.

NEW SAFETY FLAG features non-conductive diagonal wind stay, reports Industrial Products Company. Flags are fluorescent, and stays are also non-magnetic, making them applicable to specialized electric utility applications. Sizes available range up to 24 by 24 inches. Circle No. 26.

AUTOMATIC BURNERS: Iron Fireman Manufacturing Company has issued a detailed folder describing pre-wired, pre-tested panel control systems for automatic burners in commercial and industrial boiler installations. Circle No. 20.

NEW SINGLE ROLL CRUSHER has been announced by Pennsylvania Crusher Division. Manufacturer states that low operational and maintenance costs are the outstanding features. Circle No. 22.

FAIL-SAFE ANNUNCIATOR differentiates immediately between its own component failure and an alarm in the system being protected by utilizing two lamps per annunciator point. Bulletin 108 by Panalarm Division of Panellit, Inc. describes the equipment. Circle No. 28.

WELDING WIRE POCKET GUIDE has been published by Air Reduction Pacific Company. The 84-page booklet provides answers to most questions concerning steel, aluminum, copper and copper base, stainless steel, titanium and special welding wires used with Air Reduction's welding process. Circle No. 29.

RAINWEAR and protective clothing is described in a 12-page brochure by Mine Safety Appliances Company. Circle No. 30.

SAFETY GLASSES: A 12-page bulletin S-8582 lists frame types and specifications of glasses made by Safety Products Division, American Optical Company. Circle No. 39.

TIRE MOUNTED TRACTOR features four wheel drive, four wheel steering. The unit is in 52 brake horsepower class and made by Napco Industries, Inc. Circle No. 41.

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DECEMBER 1959 **NOT GOOD IF MAILED AFTER JANUARY 25**

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INSTRUMENTATION: A 16-page brochure by Panellit Service Corporation describes its complete installation through start-up service for automation and instrumentation systems. Circle No. 31.

LARGEST HAMMERMILL ever built by Iowa Manufacturing Co. has been announced as the Model 5040. It has a 40-inch hammer arc and 50-inch wide feed opening. The unit is equipped with the standard three rows of hammers, but can easily be changed to a two-row hammermill with or without grates. Circle No. 37.

SPIRAL REAMER is said to be world's first hand reamer for 3¼ and 4-inch pipe and conduit. The tool has a ratchet handle and seven spiral cutting edges. It is made by The Ridge Tool Company. Circle No. 38.

PRESSURE REDUCING VALVES: A folder describes Type B, single seat, piston-operated and pilot actuated pressure reducing valves made by Atlas Valve Company for steam, oil, air, gas or water lines. Circle No. 32.

NEW CRAWLER CRANE has been announced by Thew Shovel Company. The unit is 14 feet long, 13 feet wide and handles up to 110 feet of boom. It is a 40-ton model mounted on a crawler turntable. Circle No. 33.

CRAWLER TRACTOR: The new TD-9 model made by International Harvester Company features 55.7 drawbar horsepower and is described in a company bulletin. Circle No. 34.

WIRE CLOTH made by Newark Wire Cloth Company is described in a new bulletin. Items covered include: filter cloth, space cloth, mesh cloth, backing cloth and others. Circle No. 24.

CLARIFIER OVERLOAD can be instantly detected by operator by means of a new indicator developed by Graver Water Conditioning Company. Unit is called Protecta-Trol. Circle No. 1.

NEW POWER SAW has been introduced by Porter Cable Machine Company for heavy duty applications in mining and heavy construction. Model 510 is said to be adaptable to all types of cuts from long rips to compound mitres. Abrasive blades are available for the 10¾-inch saw. Circle No. 2.

TURBINE TYPE PUMPS made by Aurora Pump Division, New York Air Brake Company have been redesigned. Major change on two-stage pump is a revised shell housing which directs fluid from first to second stage in a 180° crossover. This balances forces in first and second stage. Circle No. 3.

NEW FILTER MATERIAL uses a microfine rayon fiber in a matrix of Vinyon bonding fiber. Hollingsworth & Vose Company state that applications will be found in dust respirators, separation of immiscible liquids, and separation of dust mists from gas and air streams. Circle No. 35.

RUST INHIBITOR developed by Corrosion Reaction Consultants for use on electrical and electronic equipment is said to seal out water and moisture, protect metal surfaces against corrosion. CRC2-26 compound can be sprayed on equipment or components can be immersed in it. Circle No. 36.

MOTOR CONTROL DIGEST containing descriptive data on pricing, technical, and engineering information has been prepared by Allis Chalmers Company. The 162-page digest is available only on request on company letterhead. Circle No. 40.

DRYING OVEN for ore samples has a temperature range of 100 to 600°F. Made by Electric Hotpack Company, Inc., the oven is said to provide accurate temperature conditioning for moisture determination analysis. Circle No. 13.

SPOTTER for railroad cars at a sliding has been designed by Hewitt-Robins, Inc. The new spotter is said to eliminate the hazard of conventional spotters which allow rope to coil up in a pile at operators feet. Circle No. 14.

GENERATOR SETS driven by gasoline and Diesel engines are described in the new 1960 general catalog of D. W. Onan & Sons. Models available range from 500 to 230,000 watts. Circle No. 15.

MECHANIZED ROOF SUPPORT for use in longwall mining is the subject of an eight page bulletin, which describes Roofmaster equipment made by Dowty Mining Equipment Company. The unit is said to provide all functions of roof control on a 600-foot longwall face. Circle No. 16.

PROCESS WATER and waste treating equipment, which can be custom designed for mining and metallurgical industries, is described in Bulletin 90 by Infilco Inc. Circle No. 17.

DRILL TOOLS: Revised 12-page Catalog 759 from Brunner & Lay contains specifications of every tool in company line, including Rok-Bits, drill rods, striking bars and extension steel. Details are included on a new line of rope thread blast hole drilling tools. Circle No. 21.

PULLEY BULLETIN by Stephens Adamson Manufacturing Company shows detailed diagrams and specifications on a new Curve Crown welded, all steel pulley. If you write the company, specify Bulletin 558. Circle No. 19.

MAINTENANCE KIT contains hydraulically operated tools for servicing of crawler tractors and earth moving equipment. Removal and installation of gears, bearings, sheaves, pulleys, bearing cups, shafts, etc., can be accomplished with kit made by Owatonna Tool Company. Circle No. 43.

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(Such as: mine supt., mill foreman, mining engineer, managing director, etc.)

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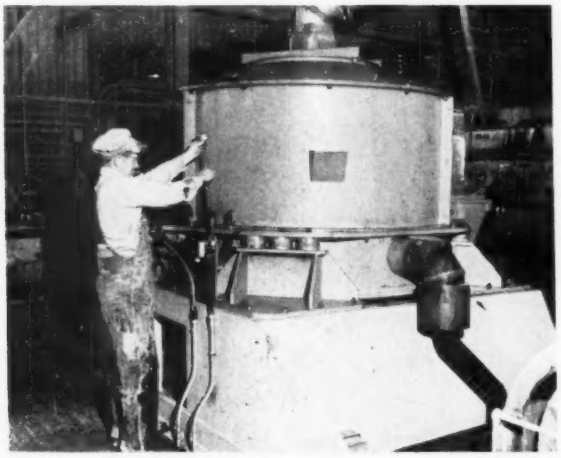
MONEY-MAKING METHODS

Centrifuge Has Many Advantages



BIRD-HUMBOLDT CENTRIFUGE replaces solid bowl Bird centrifuge for granular potash separation.

Less crystal degradation, lower capital investment, increased capacity, lower power consumption, and less operator attention have been achieved by using a new Bird-Humboldt centrifuge at the Carlsbad, New Mexico potash mill of United States Potash Company.

The new unit is installed at the granular plant to separate salt and product from feed liquor after the potash ore has passed over shaking tables. Excessive fines in the granular potash product has always been a major operational problem as customers don't want fines.

The new centrifuge consists of a vertically mounted perforated basket, slightly conical in shape, which is given a vertical oscillation while it rotates on a fixed spindle. The rotation generates the centrifugal forces necessary to sling out the feed liquor while the oscillation produces force components in an upward direction which move the solids to the point of discharge.

The centrifuge was designed in Germany by Humboldt and initially sold in the United States by the Bird Company. A manufacturing agreement has been worked out so that the units are now made here and sold under the trademark of Bird-Humboldt.

Ride or Float Over Utah Tailing Pond with New Swamp Buggy

A Teracruzer "swamp buggy" that rolls or floats on eight large low-pressure sausage-shaped rubber bags (tires) is traveling or cruising the world's largest tailing pond at Garfield, Utah.

Kennecott Copper Corporation uses this buggy to transport men and material to inaccessible areas of the pond, and for plowing furrows to channel fresh tailing and water to dry areas. Before the use of the new buggy, it was almost impossible to reach the wettest areas of the pond, but the new cruiser is virtually unstoppable in sand and unmireable in mud.

The driver sits high and dry in the cab set over the front of two sets of sausage wheels. The heavy cleated rubber bags provide maximum traction and the four-wheel drive makes the unit all but unstoppable.

Drivers early learned a number of tricks for getting the cruiser out of slime. If all else fails and the bags have dug themselves deeply in, further efforts only create additional suction. The operator then must deflate the tires which allows lateral expansion to overcome the suction.

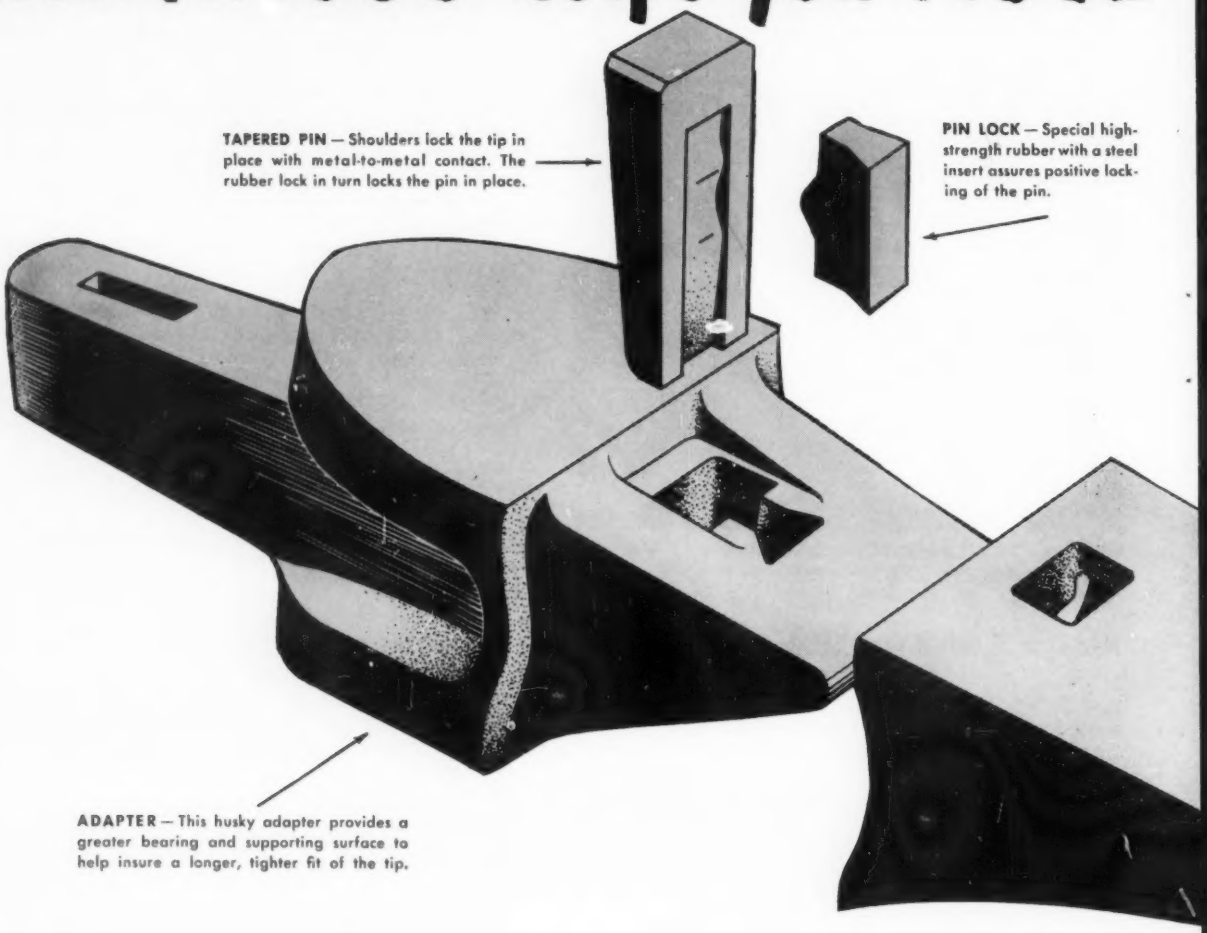
The swamp buggy may be equipped with tanks and used to spray crusting agents over dry areas not lending themselves to irrigation with wet tailings. Various known crusting agents are now being tested. When a satisfactory agent is found, this phase of the work will get underway.

MUD DOESN'T MIRE this swamp buggy as it rolls over Utah Copper's flotation tailing pond. Car gives size and height comparison.

Nchanga's 6-inch Underground Hole

Nchanga Consolidated Copper Mines Limited is using the cage raising method to sink its new 24-foot-diameter, round, ventilation shaft at its copper mine in Northern Rhodesia. By this method, the first thing to do is to drill a 6-inch-diameter hole from the surface to the 1,500-foot level. A percussion drill on surface is drilling to the 970-foot level and a second drill has been moved underground to make the hole from the 970 to 1,500-foot level. Heating the 4-foot-long percussion bits for sharpening was a problem because no open fires were possible underground. The solution was to build and use a special electric furnace which reaches a 1,800° F. temperature in 70 minutes pulling 550 volts and 5,000 amperes until furnace is heated when ampere input drops to 2,500.

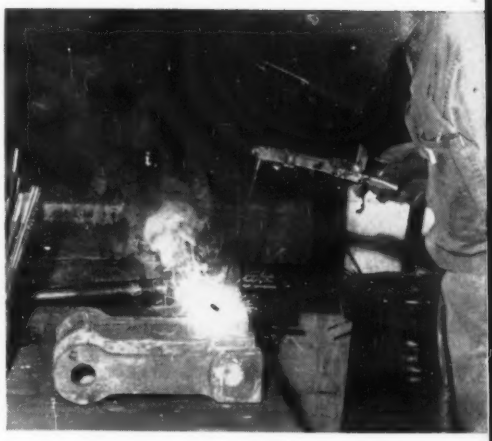
How AMSCO helps you MOVE


TAPERED PIN — Shoulders lock the tip in place with metal-to-metal contact. The rubber lock in turn locks the pin in place.
PIN LOCK — Special high-strength rubber with a steel insert assures positive locking of the pin.
ADAPTER — This husky adapter provides a greater bearing and supporting surface to help insure a longer, tighter fit of the tip.

UNBEATABLE TEAM!

AMSCO CAST MANGANESE STEEL DIPPERS

Installed as original equipment on many leading makes of power shovels. Cast of manganese steel—"the toughest steel known"—a material which provides as much as a ten-to-one advantage in lasting power over other steels, under the abuse of severe impact and abrasion. Sizes from ¾ cu. yd. to 9 cu. yd. capacity. See your power shovel distributor, or write us for booklet . . . "Amsco Manganese Steel Power Shovel Equipment".

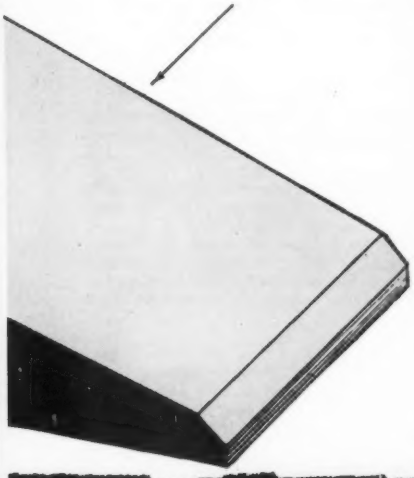


MORE TONS PER DOLLAR

AMSCO Simplex 2-Part Reversible Dipper Tooth

- **EXTENDS DIGGING LIFE**
- **STAYS SHARP**
- **EASY TO REPLACE**

REVERSIBLE TIP—Enables you to get longer digging life while maintaining sharpness.



Now you can save hours of costly shovel downtime . . . by using this new Amsco Simplex 2-Part Tooth.

Simplex tips are quickly reversible to give added tip life while retaining sharpness. And when teeth eventually become worn, just knock out the retaining pin and replace with a new tip.

Simplex adapters fit this new 2-part tooth to *any* Amsco dipper or backhoe. And because Amsco makes both dippers and dipper teeth, you can be sure of proper fit between the adapter and shovel lips.

Cast of a new alloy especially developed for this service, the Amsco Simplex design is backed by over 50 years of experience in producing dippers and dipper teeth for the most rugged digging conditions.

Ask your power shovel distributor to supply you with these extra-long-wearing Simplex 2-part teeth . . . now!

Write us for complete descriptive bulletin on Amsco Simplex teeth, giving information on sizes and types available.

AMSCO HARDFACING FOR BUILD-UP AND REPAIR

Add extra service life at low cost to dippers, dipper teeth, hammers, augers, etc. . . . with Amsco Hardfacing. Complete line of hardfacing electrodes available through your Amsco welding distributor. Or write us for condensed catalog and price list on "Amsco Hardfacing Alloys".

AMERICAN Brake Shoe COMPANY

AMSCO

American Manganese Steel Division • Chicago Heights, Ill.

Other Plants in: Denver • Los Angeles • New Castle, Dela. • Oakland, California • St. Louis

In Canada: Joliette Steel and Manitoba Steel Foundry Divisions

Welding products distributed by Canadian Liquid Air Co., Ltd.

Has no springs, rides on Hydrair*

MEN WHO MAKE NEWS IN U.S.

W. N. MATHESON

R. M. STEWART

E. R. BORCHERDT

C. DE WITT SMITH

DR. D. S. TAYLOR

DR. C. L. RANDOLPH

William N. Matheson has been appointed executive vice president of Oliver Iron Mining Division, U. S. Steel Corporation. Mr. Matheson graduated from the University of Minnesota School of Mines in 1933, and began his Oliver association in that year as an electrician's helper. After subsequent advances, he was transferred to the Division's Duluth General Offices in 1945, and, prior to this new appointment, was Oliver's vice president in charge of operations.

Richard Maclin Stewart has been appointed director of mining research of the Anaconda Company, to succeed **Edward R. Borcherdt.** Mr. Stewart began his employment with Anaconda in 1948 and has been with the mining research department since 1950. He is the author of the mining review in each MINING WORLD Annual Catalog, Survey and Directory number.

George F. Reed has been appointed resident manager of Sonoma Quicksilver Mines, Inc., Guerneville, California. From 1953 to 1958, Mr. Reed was assistant general manager of Wah Chang Mining Corporation, Bishop, California and for the past year has been a consulting engineer for various southwestern Nevada mining companies.

William W. Harwood has been appointed chief chemist for the phosphate minerals and chemicals operations of International Minerals & Chemical Corporation. He will supervise control laboratories at both the Noralyn phosphate plant and Bonnie chemical plant in Florida.

William M. Calhoun has been promoted to the position of assistant to the resident manager of American Zinc, Lead and Smelting Company's Metalline Falls, Washington operations. In addition to his supervisory duties, he will continue to direct all local geological activities.

Warren H. Westphal has joined the staff of the Stanford Research Institute, Menlo Park, California, as senior geophysicist. He was formerly chief geophysicist for the Utah Construction and Mining Company, San Francisco, California.

John C. Russell has been appointed manager of metallurgical engineering for Singmaster & Breyer, Inc., New York metallurgical and chemical process engineers. He had been project engineer for the firm on a plutonium laboratory building for the Argonne National Laboratory.

The partnership of Borcherdt and Smith, Mining Consultants, has been formed by **Ed R. Borcherdt** and **C. Dewitt Smith,** with offices at 369 Pine Street, San Francisco, California and Bedford Road, Lincoln, Massachusetts. Mr. Borcherdt has retired from his position as Director of Mining Research, The Anaconda Company, after 40 years service with that company. In his connection with Anaconda he most recently travelled to Europe visiting the Kiruna mine in Sweden and Outokumpu Oy in Finland. His summary of the London Symposium on Shaft Sinking and Tunneling appeared in the October issue of MINING WORLD. Mr. Smith has in the past been employed at mines in British Columbia, Ontario, New Jersey and Arizona, and with the Foreign Economic Administration in Washington, D. C.; his most recent positions have been with the St. Joseph Lead Company in Missouri and New York and as a vice president of the Copper Range Company, Boston, Massachusetts. Borcherdt and Smith will offer consulting services in mine management and methods, mine plant planning and lay-out, and mining property evaluation.

Frank W. Chambers, New York City, has resigned as director of engineering for Kennecott Copper Corporation to accept the position of executive vice president of Strategic Materials Corporation, Buffalo, N. Y. He will be succeeded by **M. D. Ayers,** who has been assistant to the president since 1956. Prior to joining the Kennecott organization, Mr. Ayers was employed with U. S. Steel Corporation, and as chief engineer with Hamilton Works of the Steel Company of Canada, and of the Wheeling Steel Corporation.

R. L. Brittain, former assistant superintendent of mines for American Zinc Company of Tennessee, is now production manager for mines of the Hidden Splendor Mining Company with headquarters in Salt Lake City, Utah.

Dr. Raymond L. Smith, now technical director of the research laboratories of the Franklin Institute in Philadelphia, has been appointed head of the department of metallurgical engineering at the Michigan College of Mining and Technology, Houghton, Michigan.

Richard W. Flagg of Wheat Ridge, Colorado has been promoted to chief metallurgist by Denver Equipment Company, replacing **H. J. Gisler,** who has been promoted to manager of eastern sales, with headquarters in New York.

Appointment of **Dr. D. S. Taylor** as president and **Dr. C. L. Randolph** as vice president of U.S. Borax Research Corporation has been announced. Dr. Taylor, who recently was appointed vice president of U. S. Borax & Chemical Corporation, is in charge of the technical department, and responsible for the company's activities in research, engineering, and geology. Dr. Randolph will be in active charge of operations at the research corporation's laboratory facilities at Anaheim, California.

Robert Ammon has been appointed director of milling and mineral beneficiation activities for all mining operations of the American Zinc, Lead & Smelting Company of St. Louis, Missouri. Mr. Ammon was employed in the metallurgical testing department of the Anaconda Copper Mining Company after his graduation from the Case School of Applied Science in 1910, and joined the American Zinc Company at Mascot, Tennessee in 1914. He has served as chief metallurgist of the company's operations since 1928.

John L. Robison has been named general manager of Lakeview Mining Company, with uranium mining and milling operations in Lake County, Oregon. He is also manager of Gunnison Mining Company, Gunnison, Colorado, a companion operation of Lakeview.

William T. Hill, former geologist for Putnam Associates, has joined the geological staff of New Jersey Zinc Company and will be connected with the company's exploration program in Tennessee and Virginia.

Kenneth F. Farley, director of smelting and refining at Calumet Division of Calumet and Hecla, will be taking on additional duties as director of milling, leaching, and fabrication when **Robert K. Poull** retires January 1, 1960. **Russell Lord** will assist Mr. Farley.

Arthur J. Weinig, Jr. has been named as assistant chief engineer for United States Borax and Chemical Corporation. In this position, Mr. Weinig will supervise design and process development activities at the company's potash operations at Carlsbad, New Mexico.

Recent elections of the New Mexico Mining Association disclose the following new officers: **A. E. Slover** of Hurley, to replace **Tom Evans** of Prewitt as president; **Earl Miller** of Carlsbad, first vice president; **Langan W. Swent** of Grants, second vice president.

RALPH B. UTT

Has no springs, rides on Hydrair*

—With Haulpak's exclusive air-hydraulic suspension system, you completely eliminate maintenance and repair of springs. 4 Hydrair units cushion against loading and travel shocks . . . keep unit riding level over bumps and holes. LW Haulpak also has exclusive LW power-transfer differential — permits unit to haul over wet, muddy areas that bog down competitive trucks.

You will haul more tons per hour at lower cost . . . with

LW Haulpak®

Low loading height—(only 10'1" on 32-ton size) and large top opening (14'5" x 11') makes it easy to load LW Haulpak *fast*, without spillage.

This modern off-highway truck gives you highest output at lowest ownership and operating costs. You get these profit-making benefits because the all-new, fully-proven LeTourneau-Westinghouse Haulpak is built *specifically* for rugged, heavy-duty hauling. It is not a "beefed-up" highway truck . . . nor does Haulpak have the maintenance problems common on ordinary haulers.

Notice, for example, Haulpak's rugged "V"-shaped body. This exclusive LW design gives you *bonus* yardage within a short wheelbase . . . makes for easy loading . . . and provides a low center of gravity for exceptional stability.

LW Haulpak's short, 130-inch wheelbase gives you unusual maneuverability (makes non-stop U-turn in area only 44'6" wide . . . shortest turning radius of any big off-road truck). You spot, swing around, back up and dump *fast* . . . you eliminate most maneuvering delays, complete faster cycles. You have "feather-touch" power-steer, too . . . system is located high behind bumper, well protected from damage.

And, very important, time lost for maintaining your Haulpak is practically nil. It needs *no* daily lubrication. The entire Haulpak lubrication check—*needed only at 500-hr intervals*—consists of just 4 easily-reached grease fittings. In addition, LW Haulpak's various parts and assemblies—some of them tested and proved by *millions of hours* on LW Tournapulls® all over the world— are much stronger than those used on competitive haulers.

22, 27, 32-ton sizes

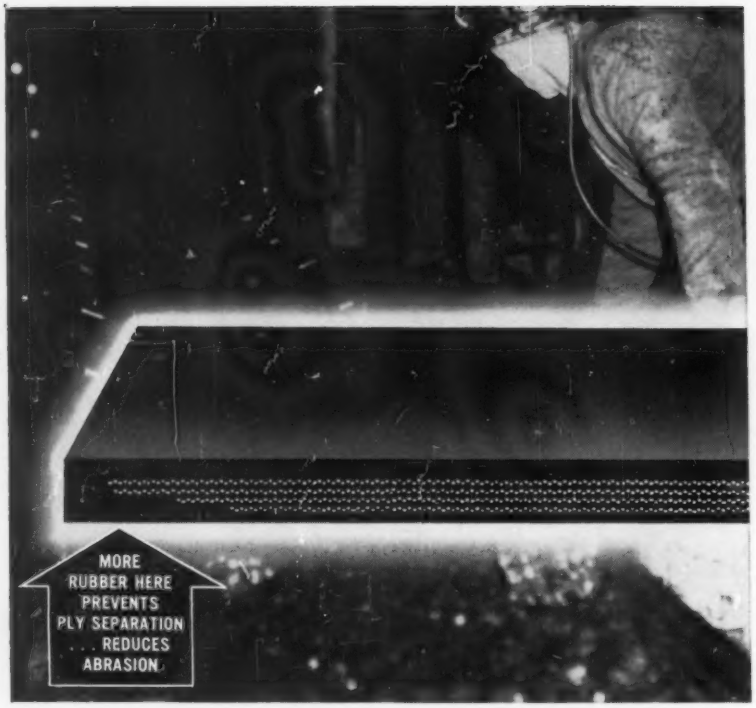
Write for detailed specifications on the size Haulpak that fits your needs. Available in 22, 27, and 32-ton sizes . . . 320, 335, and 375 hp. Compare its features with any other truck in the industry . . . you be the judge!

Haulpak—Trademark Reg. U.S. Pat. Off. HP-2155-G-1r

LeTOURNEAU-WESTINGHOUSE COMPANY, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

Where quality is a habit



EXCLUSIVE "COLEDGE"* CONSTRUCTION

gives Quaker Thermoid Conveyor Belting extra life where it counts

Unique "Coledge" construction puts more rubber *at the edges* where it's needed, prevents ply separation, makes a more flexible and wear resistant edge where abrasion is greatest. Punishment at the edges—especially the tough use dealt out in mining—can kill most conveyor belting in a fraction of the lifetime of Thermoid-Quaker belting.

Tests show Thermoid-Quaker "Coledge" construction lasts and lasts on the same jobs where other belting fails. "Coledge" construction is available on all grades of Thermoid-Quaker belting.

What's more, all Thermoid-Quaker conveyor belting is prestressed in manufacture, so that the belt is actually in compression when you get it—ready for the heaviest load without strain.

Examine Thermoid-Quaker Belting with the exclusive "Coledge" construction at your Thermoid distributor's, or write for further information to Thermoid Division, H. K. Porter Company, Inc., Tacony & Comly Streets, Philadelphia 24, Pa.

*Patent Applied For

THERMOID PORTER DIVISION

H.K. PORTER COMPANY, INC.

PORTER SERVES INDUSTRY: with Rubber and Friction Products—THERMOID DIVISION; Electrical Equipment—DELTA-STAR ELECTRIC DIVISION, NATIONAL ELECTRIC DIVISION; Specialty Alloys—RIVERSIDE-ALLOY METAL DIVISION; Refractories—REFRACTORIES DIVISION; Electric Furnace Steel—CONNORS STEEL DIVISION, VULCAN-KIDD STEEL DIVISION; Fabricated Products—DISSTON DIVISION, FORGE AND FITTINGS DIVISION, LESCHEN WIRE ROPE DIVISION, MOULDINGS DIVISION; and in Canada, Refractories, "Disston" Tools, "Federal" Wires and Cables, "Nepcoduct" Systems—H. K. PORTER COMPANY (CANADA) LTD.

RALPH B. UTT

An Appreciation
By Harry N. How

One of the saddest events of 1959 was the passing July 21st of Ralph B. Utt. To those of us who were close to Ralph, his death was a blow whose force has dissipated little in the ensuing months. To the mining industry, his loss has left a gap in the already thin ranks of its true pioneers.

It is a gap which will be hard to fill; because for most of Ralph's 51 years, he toiled tirelessly in the interests of the industry he loved so well. Only a short conversation with Ralph convinced you that here was no ordinary man, but one dedicated to a much higher goal than just meeting the challenges of everyday living.

There was a quiet intensity about Ralph, particularly in his speech, that was a reflection of his own dedication and integrity. Few who met him failed to come under its spell.

Born in Mansfield, Washington, he was reared near the Coeur d'Alene, Idaho, mining area, where he first developed his lifelong interest in mining. Ralph attended the Montana School of Mines, and received B.S. degrees in Metallurgical Engineering and Mining Engineering from the University of Idaho School of Mines.

After his graduation, his first job was as a mill operator for the Bunker Hill Company. He quickly rose through the ranks to posts of increasing importance in the Bunker Hill organization.

In 1940, he joined Western Machinery Company as a field engineer. He served both Western Machinery Company and Western-Knapp Engineering Co. in a variety of capacities. He held the post of vice-president and chief executive engineer at the time of his death.

During his association with Western Machinery, Ralph played a key role in the application of flotation and heavy media to improve process technology.

His creative approach to equipment design resulted in the ultimate development of the Torque-Flow pump, one of the most significant advances in pump design in many years—even though many of the so-called "experts" vowed its revolutionary new principle was unworkable.

In all his efforts, Ralph conscientiously applied his technical ability and practical know-how. However, he always maintained a sympathetic and understanding approach to the human aspects of his work. His genial disposition and consideration of others made him a friend to all who had the privilege of knowing him. No matter how pressed by the day's activities, he was always glad to share his experience and knowledge with others.

L. S. CATES

Louis Shattuck Cates, 77, chairman of the board of Phelps Dodge Corporation, died in St. Luke's Hospital, New York, on October 29. At one time, he was vice president and general manager of Utah Copper Company, which later became a division of Kennecott Copper Corporation. He became associated with the copper firm in 1930 and began a series of mergers that made it a giant in its field. Earlier, working with Daniel C. Jackling, he had developed inexpensive earth-moving methods which made the working of low-grade ore mines feasible.

Where quality is a habit

Save money when replacing pit tractors . . .

switch to fast, rubber-tired tractors . . . handle twice the work at half the cost!

When modernizing your pit operations, don't overlook the savings you can make by replacing two or more slow-moving track-type tractors with a fast, *rubber-tired* tractor, to handle your scattered pit and road clean-up.

Check these important savings you can make with a modern, high-speed, 218-hp LeTourneau-Westinghouse Tournatractor:

1. Between pit chores, rubber-tired tractor can handle haul-road maintenance and drainage problems . . . to keep your production units rolling *fast* and *safely*.

2. Mobile, 17.2-mph Tournatractor quickly drives to new areas of operation . . . spends its time working instead of crawling.

3. It cleans up around plant area, dresses and maintains stockpiles.

4. Tournatractor spots rail-cars, tows equipment—reduces costly time waiting for switch engines.

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WHAT'S GOING ON IN MINING

Bear Creek Stakes Claims For Copper in Montana

Bear Creek Mining Company's exploration geologists have staked more than 100 mining claims in Granite County, Montana, five to 10 miles southwest of Phillipsburg. The claims have been staked for copper; significantly, on both Copper Creek Fork and the Middle Fork, as well as in Frogpond Basin near the head of Copper Creek. Ore grade copper samples were found by company geologists on a number of dumps from location holes, prospect holes, and other underground workings.

Extensive geochemical and geophysical surveys have been made on many of the located claims by Bear Creek. Prospecting and evaluation of the claims is difficult because of the heavy timber and glacial moraine in many areas.

Company geologists are now evaluating copper anomalies and geological maps to determine the best locations for surface drilling and underground exploration.

The area has always been considered a manganese, lead, and silver district, and a number of claims have been patented for these metals.

Bear Creek, Kennecott Copper Corporation's exploration subsidiary, has spent millions of dollars in the last several years under the direction of president C. H. Burgess of Salt Lake City, Utah. Greatest copper reserves purchased by Bear Creek to date are north of Safford, Arizona. There is more than enough acreage staked in Montana for an ore body of the same size as that at Safford.

Mines Bureau Reorganizes Northwest Region Offices

New and more efficient methods of breaking rock and ore will be sought at the new Spokane Office of Mining Research, United States Bureau of Mines. Basic research will be directed toward rock fragmentation by cavitation, dielectric heating, and ultrasonic vibrations.

Also getting under way at the new research station is a study of rock pressures and ground control in the deep mines of the Coeur d'Alene mining region in northern Idaho.

The new office will be directed by Wing G. Agnew, formerly chief of the Bureau's Spokane field office which developed a phosphate rock planer and precast concrete mine sets. His office is one of five major organizational units in the reorganized Northwest Region I which includes Alaska, Idaho, Montana, Oregon, and Washington. The other major units are a division of administration, a division of mineral resources, and a metallurgy research center, all located at Albany, Oregon; and a coal research laboratory in Seattle.

Little Squaw Mining Company has suspended its Chandalar District operations in Alaska for the winter because of freezing of the water supply for a drilling machine. The season's work included hauling in of two trailer houses and mining machinery from the Chandalar Lake ice air strip, reopening of 400 feet of ice-filled tunnel, raising 103 feet to the bottom of the old Mikado mine shaft, drifting a short distance on the ore zone, and doing some drifting at the main tunnel level. Drifting on the ore zone at the bottom of the Mikado shaft showed a four-foot vein. Frank E. Birch of Spokane, Washington, mining engineer, had the contract. He was assisted by Bob Nusbaum, a University of Idaho student. The Little Squaw firm is owned by **Grandview Mines, Inc.** and **Metaline Mining and Leasing Company** of Spokane.

The **Cobol Group** gold property on the west coast of Chichagof Island on Slocum Arm may be diamond drilled by John T. Brockway and Sid Ellis. The property was held for many years by Mr. and Mrs. George Bolyan.

Diamond drilling, drifting, and crosscutting are called for in a $40,270 exploration contract approved by the **Office of Minerals Exploration** at the old **Golden Copper Queen** mine on Agency Creek, McDevitt District, Lemhi County, Idaho. Values are in copper, gold, silver, and thorium. Harold P. Allen of Salmon and Pocatello is president of **Golden Copper Queen Mining Corporation,** which will do the work.

At the Hall Mountain properties of **Northwest Prospecting and Development Company** in Boundary County, Idaho, drilling was started recently to determine the size of a body of thorite exposed by bull-dozing. Herb Sams of Elk, Washington, drilling contractor, had the contract.

Idaho Mining and Milling Company expects to complete its new mining camp in Idaho County's Florence Basin this December, and start gold dredging operations in 1960. Anton R. Backus of Hollywood, California, mechanical engineer, has been named second vice president. Philip W. Jungert of Lewiston is president.

The **Silver Mountain** deep exploration project east of Mullan, Idaho has been discontinued after four years of work at a cost of almost $1,500,000. **Hecla Mining Company** and **Bunker Hill Company** had been probing beneath the old **Snowstorm** copper-silver mine in a joint venture project. Miners tunneled nearly 6,500 feet northeasterly from the bottom of a 2,000-foot shaft. Three diamond drill holes from that point penetrated as much as 1,030 feet beyond the end of the crosscut, but no mineralization was found. The rock formation beyond the fault was considered unfavorable for ore deposition. Rails are being pulled and mining machinery removed.

The **Bunker Hill** mine at Kellogg, Shoshone County, Idaho, largest single lead

Lucky Friday Mill Tune-Up in January

The new 500-ton concentrator of Lucky Friday Silver-Lead Mines Company east of Mullan, Idaho is scheduled to go into operation next month. Built at a cost of $600,000, it will double the firm's current output. The main mill building will house two thickening tanks. Above and behind the building are (left to right) a fine ore bin, primary crusher, and coarse ore bin. Shops, change room, and mine offices are off to the right of the mine dump and not visible in picture. Erection of the two ore bins involved a new construction technique developed by a Spokane concrete firm. Staves 35 feet long by 24 inches wide, wrapped with series of steel bands, were used to frame the circular bins. Hecla Mining Company now controls Lucky Friday.

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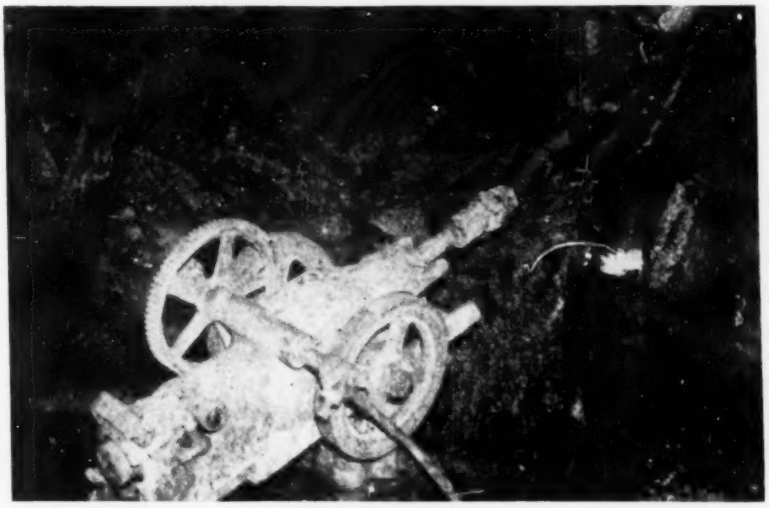
mine in the United States, currently is yielding 1,800 tons of lead-silver-zinc ore daily. Production is from seven different veins. Thirty veins of ore have been found in this great mine in its 74-year history and have yielded 24,000,000 tons of ore to date. Six hundred men are employed underground in workings which range from 3,600 feet above sea level to 1,387 feet below. The **Bunker Hill Company** is owner and operator.

Floyd Wilson of Hailey, Idaho and Martin Curran of Hagerman, co-owners of the **Le Grand** group of claims seven miles northwest of Hailey, report they have found a lead-silver vein on the property. The discovery was made while doing annual assessment work. They have scheduled a carload shipment of ore to the Tooele, Utah smelter of **International Smelting & Refining** Company.

Fred La Sota of Van Nuys, California believes he has found a "lost" Idaho gold mine. The property is located on Whiskey Mountain in Owyhee County. It was originally discovered in 1904 by Gustavus Bergh, according to La Sota, and yielded gold and silver until the vein was "lost". He says that last year he traced the vein on surface for approximately 12,000 feet. A crew is presently sinking a shaft and making preparation for working the mine.

American Smelting and Refining Company has completed driving of a new adit at the **Jack Waite** Mine on the Idaho-Montana border northeast of the Coeur d'Alene mining district. The adit intersects the Jack Waite vein on the Idaho side of the boundary. J. C. Kieffer of Wallace is manager of the operating firm, **American Smelting and Refining Company.**



Can You Identify This Rock Drill??

This early-day mechanical drill was found, just as shown above with the bit still in the hole, in an old tunnel on a property now under development by Monarca Mines Inc. in the old Silver City district of Owyhee County, Idaho. It was apparently abandoned many years ago, possibly before the turn of the century. Operation of the machine is by hand crank (lower center). The large bar with jack screws below the gear wheel holds the drill in place by wedging against the tunnel walls. The machine has since been removed from the tunnel and found to be in operating condition despite the accumulation of rust. The word "Denver" was readable on the side of the main casting, but the rest of the name plate could not be deciphered. The drill is now in the possession of E. R. Lindquist, president of Monarca Mines. The firm is currently developing a north-south vein structure apparently now known to the operators who left the drill.

WASHINGTON

Dawn Mining Company's uranium processing mill at Ford, Stevens County, Washington, continues on an around-the-clock operating basis and its second-half quota of 80,000 tons of ore is expected to be reached shortly before Christmas. However, mining and ore hauling operations at the firm's **Midnite** mine in the Spokane Indian Reservation have been suspended until spring. A total of 130,000 tons of ore was mined and hauled to the mill this past season. **Isbell Construction Company** of Reno, Nevada, and **Vic-Ore, Inc.**, Spokane subsidiary of **Consolidated Freightways, Inc.**, have finished three-year mining and hauling contracts. Part of the Isbell crew has been doing surface stripping at the mine.

First zinc concentrate was shipped recently by **Utahcan Mines, Inc.** from its new concentrator in the Jim Creek Mining District of Pend Oreille County, Washington. Plans called for stepping up operations to 100 tons each 24 hours. Zinc-lead silver ore is beng mined by open-pit methods. The camp has been readied for winter operations.

In northern Spokane County's Mount Spokane uranium district, **Daybreak Uranium, Inc.** has contracted for exploratory drilling of all untested ground at its **Dahl** lease. The firm has been making occasional small ore shipments to the Ford, Washington uranium processing plant. James W. Fox of Greenacres and Kae H. Sowers of Opportunity have been reelected president and secretary-treasurer, respectively.

MONTANA

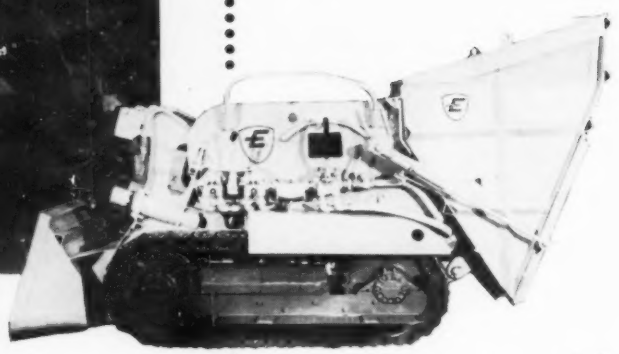
Open-pit prospecting by bulldozer has uncovered wide mineralized zones with lead-zinc values at the Mineral County properties of **Mineral King Mining Company** north of Saltese, Montana. In one pit, a 70-foot face clearly shows the route of mineralizing solutions to a surface "blowout." Another pit has obtained about 150 feet of depth on an ore structure, and the ore now seems to be in place. Values are concentrated on footwall and hanging walls. The work is 1,000 feet northwest of the old **Tarbox** mine. Charles F. Buls of Missoula is president.

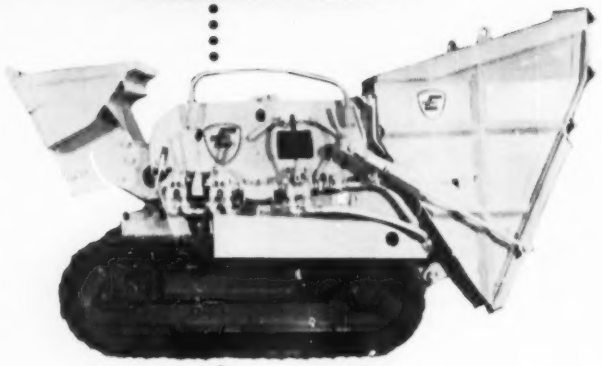
Anaconda Company will lease 100 acres of land in Anaconda, Montana to the **Webb and Knapp Strategic Corporation** for $1 per year so that a $5,000,000 steel plant can be constructed near Anaconda's huge slag pile. The new mill will recover iron from the waste slag, and Webb and Knapp have contracted to purchase 40,000,000 tons for treatment. The plant is to be substantially completed by December 31, 1962. A similar project is underway by Webb & Knapp at Clarkdale, Arizona (See MINING WORLD, November 1959, page 66). Both plants will use the Strategic-Udy process on the copper slag.

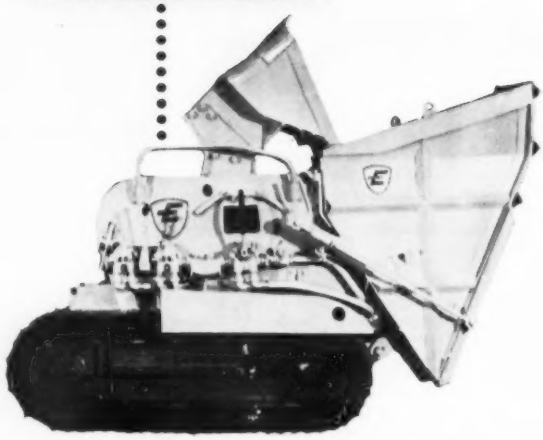
The **Obelisk Exploration Company** has been incorporated for $100,000. Plans call for reopening of the **Obelisk** mine, located about three miles east of Basin, Montana.

Great Northern Railway's mineral research and development department surveyed and mapped several significant non-metallic industrial deposits last year along the Great Falls-Billings line in Montana. A report of the study is available for study at the **Montana School of Mines** in Butte or at offices of the railway's mineral research group at St. Paul, Minnesota, Williston, North Dakota, and Seattle, Washington. Among the deposits, the report includes maps and data on a 2,000,000-ton gypsum deposit, and a number of "chemically acceptable" limestone deposits in excess of 4,000,000 tons. Mapping is being continued along the same region.

The **Anaconda Company** says it will not reopen the **Emma** mine because it would be uneconomical. There had been only a small reserve of manganese and zinc ore left and its shutdown by the copper strike made it too expensive to reopen. The mine is now being flooded. The **Anselmo** zinc mine is in jeopardy for the same reason. It has lost money for years with a production cost of more than 15¢ per pound, while the price of zinc is about 11¢.







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COLORADO

Shenandoah Limited has managed to continue its tunneling and exploration work at Silverton, Colorado, despite steel and smelter strikes, and bad weather. The Ameriean Tunnel is being steadily advanced and has almost reached its initial objective. Two shop and warehouse buildings have been completed, along with the snow tunnel which should enable work to continue through most of the winter. The firm bought the old **Western Colorado Power Company's** substation and buildings east of town, and is remodeling them into a warehouse and offices.

Denver-Golden Oil & Uranium Company of Denver, Colorado was able to drive its Burbank tunnel more than 700 feet by mid-November and was hoping to be able to complete it by year's end if weather did not interfere. The firm's gold mining operations are in the Ice Lake region of San Juan County. About 1,200 feet of drifts and raises were to be driven, according to the original plan, to reach gold-bearing veins which outcrop at surface.

Ophir Gold Mines Company of Cripple Creek, Colorado has taken a lease on property of **New Gold Dollar Mining Company** and plans to repair the 1,300-foot Gold Dollar shaft in an effort to place the property in production. The company also plans a drive from the New Gold Dollar shaft to the lower levels of the Ophir.

Nat and Muriel Gold, owners of the **Elisha** group of claims on Cochetopa Creek near Gunnison, Colorado, have given a three-year lease to Leslie Dunlap and Roy Busby of Denver. The pair plan to explore for mercury. Previously, the claims had been leased to uranium miners who surrendered their lease.

Climax Molybdenum Corporation has increased its output to 33,000 tons per day, seven days a week. Substantial sales of molybdenum for export are reported to be the reason for the increase.

The **Office of Civil and Defense Mobilization** has granted **Gunnison Mining Company** rapid amortization on 80 percent of the cost of its $2,025,000 uranium ore processing plant at Gunnison, Colorado. The certificate for rapid depreciation allows a company to write off part of a facility's costs in five years instead of 20 years or so. This lowers the firm's income taxes for the first few years, but increases them later, provided tax rates remain the same.

Four Corners Oil & Minerals Company has leased some of its claims in the Bull Canyon area of Montrose County, Colorado. Production by the new lessees is expecced to start soon, and at a higher rate than in recent months.

Rico Argentine Mining Company again concentrated on sulphuric acid production in 1959, although lead-zinc mining and milled were resumed on a limited basis during the last half of the year. The mill operated at about 25 percent of its daily capacity during that period. **The Mountain Spring** area produced 2,799 tons of lead-zinc ore, and the Argentine 1,902 tons. From this 650 tons of zinc concentrates and 355 tons of lead concentrates were shipped. Of the 37,950 tons of pyrite mined for the acid plant during the year, 37,659 tons came from the Mountain Springs area, and it now appears that this will be the main pyrite source for the plant. The plant produced 39,529 tons of 100 percent basis commercial sulphuric acid during the year. A new electrostatic hot precipitator was installed but did not perform satisfactorily. The unit was then rebuilt, and acid production is expected to improve.

"The Role of Stress Waves in Fracturing of Rock" will be studied at the **Colorado School of Mines** under a **National Science Foundation** grant of $32,400. Dr. John S. Rinehart, director of the school's mining engineering research laboratories, will be in charge of the three-year project. The project will expand studies in the field of impulsively loaded material failures.

Climax Molybdenum Company's Management Engineering Department conducted exploratory drilling this past summer to obtain additional information about underground rock conditions. The work was done in conjunction with planning of the new production level 300 feet below the Storke Level. A number of suggested ore transportation systems have been under consideration for bringing ore to the surface from this new 600 Level. The study of underground rock conditions will help determine whether it is advisable to construct a primary crusher near the shaft station on this level so that ore could be sufficiently reduced in size for the hoisting through the No. 4 shaft.

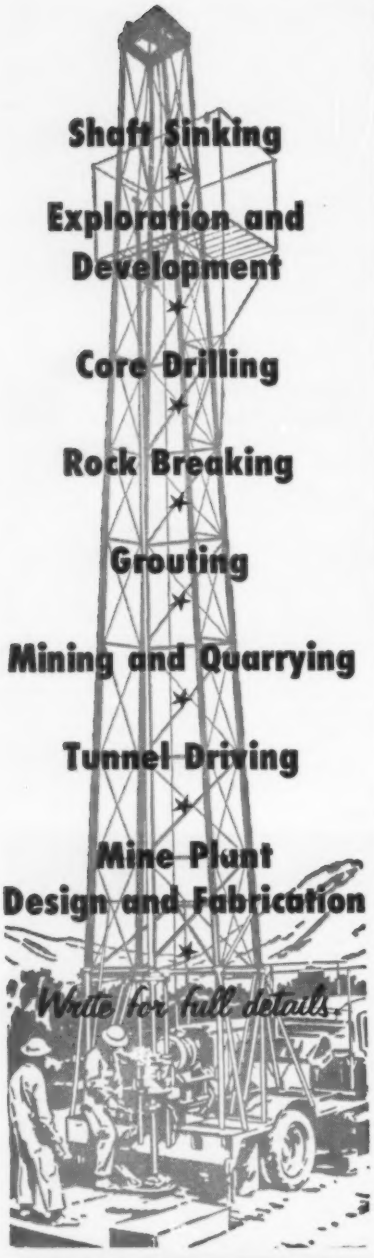
Colorado School of Mines researchers will have an isotope analytical laboratory about next February. Construction of the $110,000 building has been started.

WYOMING

Stockholders of **Western Nuclear Corporation** have approved a change in name to **Western Nuclear Inc.** The registration of the firm has also been transferred from Wyoming to Delaware. One share in the new corporation will be issued for each five shares now held. Mining is underway in the firm's **Frazier-Lamac** pit in the central Gas Hills. MACO has now removed over 6,000,000 cubic yards of overburden as the first phase of its stripping operations. Ore is being stockpiled pending shipment to the company's mine at Jeffrey City. In the East Gas Hills, shipments have started from the **P-C Mining Corporation** pit, also being mined

Uranium Mill Ready Ahead of Schedule

The new 522-ton-per-day uranium mill of Federal-Radorock-Gas Hills Partners has gone into operation in the Gas Hills area of Wyoming just six months after start of construction. According to the AEC, this is the shortest time in which a major new uranium mill has been completed in the United States. The partnership, managed by Federal, will supply 389 tons a day from its own properties; the remainder will come from independent producers. Total investment cost in both mining and milling operations exceeds $6,000,000. Under the agreement, Radorock and Federal will first recover their development expenses; the profits will then be divided on the basis of 30 percent each for Radorock and Federal, and 40 percent for Gas Hills. Western-Knapp Engineering Company designed and constructed the mill. It uses the Infilco acid leach Resin-in-Pulp process.



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by Western Nuclear. This ore will go to the **Susquehanna-Western** mill in Riverton. Western Nuclear hopes to recover about 20,000 tons of 0.20 percent uranium ore from the pit.

Gas Hill uranium operators have been asked to contribute to a plan for paving the road from Riverton, Wyoming to the Gas Hills district. Users of the road have been asked to contribute $90,000; another $90,000 would come from state-county funds, and $320,000 from the federal-aid-state secondary funds for a total of $500,000. A heavy-duty road is needed to stand up under the heavy truck traffic. Operators in the Gas Hills and truckers have spent about $100,000 in the past two years to keep the road maintained.

Big Horn Gypsum plans to build a $3,000,000 gypsum board plant at Cody, Wyoming. The firm has a lease on a large deposit 4½ miles south of Cody, owned by the Taggart family, and this would supply the raw material for a 100,000,000 feet of gypsum board annually, according to reports. Sid H. Eliason of Salt Lake is president of the new firm; E. L. Hildebrand is executive vice president.

Through the gift of a very rare mineral from the Kola Peninsula in Arctic Russia, scientists of the **U.S. Geological Survey** of the **Department of the Interior** have been able to identify an unknown mineral recently discovered in the Green River oil shale formation of Sweetwater County Wyoming. The Russian mineral "labuntsovite" is a complex sodium-potassium-barium-niobium-titanium silicate, recently brought to Washington from Moscow by Professor K. A. Vlasov of the Academy of Sciences, U.S.S.R., for a comparative study of its physical and chemical properties with those of the then "unknown" mineral from Wyoming. Labuntsovite was first recognized by Russian mineralogists in 1955. A year later, material like it was found by Survey geologists in Wyoming. The mineral is of special interest to earth scientists, because it is one of several rare species found in the Green River sedimentary rocks (water deposited) that elsewhere in the world are found only in igneous rocks (molten rock). Geological conditions existing at the time of formation of labuntsovite and the other Green River minerals were unique. In fact, many of the minerals discovered by Survey scientists in this formation are not known to exist anywhere else on earth.

UTAH

Two tracts of phosphate-bearing land in Daggett County, Utah are being offered for lease by the U.S. Bureau of Land Management. Sealed bids must be submitted to the manager of the Bureau's land office, Box 777, Salt Lake City, Utah on or before 1:00 p.m. December 9 for one tract and December 10 for the other. The deposits are on a north branch of the Uinta Mountains, northwest of the town of Vernal, Utah. They are in T.2 N., R. 20 E., SL Mer. (see darkened area at top of map). The first tract con-

taining 2,373.77 acres is in part of Sec. 2, all of Sec. 3 and 4, and parts of Sec. 5 and 6. The second tract contains 2,509.48 acres and is in parts of Sec. 7, all of Sec. 8 and 9, and parts of Sec. 10 and 11. Some 3,000 acres in the same area have already been leased by John H. Morgan Sr. and Jr. San Francisco Chemical Company holds the huge Humphreys deposit 15 miles north of Vernal in Uintah County.

In a new set of regulations issued by the **U.S. Department of the Interior**, the allowable potash lease acreage in a single mining unit has been increased from 12,800 acres to 25,600 acres. An additional 2,560 acres will be allowed for fringe areas. In addition to the regular filing fee, 25¢ per acre annual rental will now be charged on new potash prospecting permits.

A new raw materials research laboratory will be built at the Geneva Works of **U.S. Steel Corporation's Columbia-Geneva Division** near Provo, Utah. The center will conduct intensive studies on western produced iron ores, coal, coke, and other raw materials used in making steel. Completion date is planned for early in 1961.

The **Securities and Exchange Commission** has finally approved **Atlas Corporation's** proposal for a merger of five of its uranium firms. Companies involved are **Hidden Splendor Mining Company, Lisbon Uranium Corporation, Rio de Oro Uranium Mines Inc, Radium King Mines, Inc.** and **Mountain Mesa Uranium Corporation.** Hidden Splendor will be the surviving name. The merger creates one of the largest independent uranium companies in the country, with total assets valued at more than $65,000,000.

During the first eight months of this year, **Hecla Mining Company** sold 29,768 tons of uranium ore assaying 0.736 percent U_3O_8 from the **Radon** mine near Moab, Utah. The mine is operated by Hecla for **Radorock Resources Inc.** and so only 25 percent, or 7,442 tons, were for Hecla's account. In addition, 11,573 tons of ore assaying 0.674 percent were mined and stockpiled, with 2,926 tons credited to Hecla. Production from the **Hot Rock** group during this period total 4,470 tons, assaying 0.359 percent U_3O_8 all of which was sold for **Hecla's account.**

precipitates—SOUTHWEST

Cyprus Will Sink Second Shaft at Copper Property

Cyprus Mining Company is making plans for sinking a 500-foot shaft on the Copper Queen property, located 3,000 feet south of the Old Dick shaft at Bagdad, Arizona. Sinking operations are to start early in 1960.

At the Old Dick mine, development work has been started on the 800-foot level now that shaft sinking there has gone below 800 feet. Development work in ore is continuing on the recently opened 650-foot level, too. Major production comes from between the 400- and 525-foot levels, and some from the area between the 150- and 350-foot levels.

Milling operations continue at the rate of 245 tons per day. Copper concentrates are stockpiled at the mill pending settlement of the strike at Asarco's Hayden smelter. Zinc concentrates are shipped to the smelter at Bartlesville, Oklahoma.

Curtis Sundeen is resident manager; Joe Sierakoski is mine superintendent, and Alan Hunt is mill superintendent.

Brunson and Grimes of Payson, Arizona, have completed a 200-foot tunnel at the **Bernice** group of quicksilver claims in the Sunflower district of Arizona, and are now directly below the open cut from which previous production came. They plan to core drill to test the area both north and south. The mill is operated intermittently, both on company and custom production.

The **Deep Shaft Mining Company** of Tucson, Arizona, has started exploration work at the **Silverfield** property. This group of seven unpatented claims is located in the Buckskin Mountains, 30 miles northeast of Bouse. A crew of four men is employed driving a crosscut under the area where good gold values were obtained in surface cuts. Richard E. Schmidt, one of the principals in the company, is directing the work.

Metate Asbestos Corporation reports that its new mill, east of Globe, Arizona, is running smoothly and producing exceptionally clean fibers. Some improvement in marketing conditions is said to have developed with much of the No. 3 grade going into filters, and the No. 5 and No. 7 grades going to the building trade for insulation and plasters. Metate is operating the **Emsco** mine, and custom milling for the operators of the **Asbestos Peak**. J. L. Neal of Globe is Metate general manager.

The **Glendel Mining Company** of Phoenix, Arizona, has started a major development program at the old **Congress** gold mine near Congress Junction, Arizona. The plan calls for driving a 3,000-foot tunnel on the northeast slope of the mine to pass beneath the old Congress ore body and permit the mine to be worked above the 650-foot level by slushers through raises and ore passes to the new haulage level. The adit has already been advanced over 100 feet, the work being done under contract by Ike Kusisto of **Mines Contracting Company**. D. W. Jaquays is president of Glendel.

The **Century Mining Company** of Bouse, Arizona, has announced plans for erection of a sink-float and jigging plant for the treatment of manganese ores. The company proposes to handle both custom ores in a 400-ton-per-day plant, producing a plus-30 percent concentrate. Included in the company holdings are the **West Black Mule** and **East Black Mule** claims. Preliminary work on the mill site has started with Jim F. Hicks directing operations. Associated with him in the project are Texas oil and construction interests.

Western Gold & Uranium Inc. is continuing ore shipments from its **Orphan** mine at Grand Canyon, Arizona, at the rate of 4,000 tons per month. The ore goes to the Tuba City plant of **Rare Metals Corporation.** For the past year, the company has been engaged in an intensive development program, designed to fully explore the ore potential of the deposit. The vertical shaft has been completed to 1,600 feet and a crosscut at the 1500 Level has been driven 900 feet. It will be connected by a 150-foot service raise to the 245-foot level of the present mine workings. Stoping is in prograss on the 175, 245, and 310 levels. Development material is hoisted through the vertical shaft. Some men and materials are still handled by the aerial tram. However, before the end of the year, the company expects to serve all mining needs through the shaft and thereby eliminate the multiple handling incident to tram operation. The limited capacity of the tram has prevented expansion of mine output.

Inspiration Consolidated Copper Company is nearing completion of its new McDonald headframe for the **Christmas** mine at Winkleman, Arizona and shaft sinking equipment is being installed. Orders have also been placed for ore hoisting and crushing equipment The warehouse building is finished and mine change house and office are almost ready for use. Pilot mill testing has been going on and a final decision on a mill flow sheet is expected soon. The property is scheduled for production in about three years.

Hunting Geophysical Services Inc.'s exploration work in the San Carlos Apache Indian Reservation of Arizona is being undertaken for the **San Carlos Exploration Company** of St. Paul Minnesota. Details of the project are reported in MINING WORLD, October 1959, page 60. Hunting negotiated the exclusive permit for San Carlos and has now transferred it to the firm, subject to approval of the Department of the Interior.

United States Borax and Chemical Corporation was the only bidder on a 10-acre parcel offered for sodium lease in the **U.S. Bureau of Land Management.** The firm's sealed bid was $26,000. The property is in Kern and San Bernardino counties, not far from the **Pacific Coast Borax Company's** operations at Boron. Pacific Coast Borax is a division of U.S. Borax.

Brush Beryllium Company of Cleveland, Ohio plans to build a $500,000 plant in Hayward, California. Operations are to begin in April 1960. Brush Beryllium recently negotiated an agreement with **Beryllium Resources Inc.** which calls for an exchange of information and assistance. Beryllium Resources has control of the **Mt. Wheeler** beryllium deposits in Nevada.

Cedarville Mercury Mines Inc., of Reno, Nevada, reportedly plans to reopen either the **Occident** or the **Cortelyou** mercury mines located on the Beattie ranch 10 miles northwest of Cloverdale, California. The firm has leased the property for 18 years. O. D. Wray is president.

In the year ended June 30, 1959, **Sonoma Quicksilver Mines Inc.** at Guerneville, California furnaced 30,489 tons of mercury ore to recover 9.784 pounds of quicksilver per ton or a total of 3,925 flasks. It is believed that plant recovery can be improved by changes in method of handling and retreating the dust in the furnace exhaust and condenser system, and tests are underway. Preparation of new stoping areas at the 1086 Level is continuing. A steeply inclined winze has been sunk on the edge of an ore zone to initiate development of the new 12 Level at 125 below the 1086 and lateral work is now underway. The main shaft will be connected with the 12 Level, and ore production from the 12 Level is expected before the end of the year.

In an investigation of the inactive **Butler Estate** chromite mine in Fresno County, California, the **California Division of Mines** has located an unusual asbestos formation. The material is reported to be an intimate mixture of slip-fibre chrysotile asbestos and talc, with minor amounts of magnesite, magnetite, and limonite. It occurs in sheared ultrabasic country rock known locally as "mountain leather." The available reserves of this "mountain leather" appear to be extremely large and relatively uniform in composition.

Belmont Mine Company is reopening the **El Dorado South** property at Belmont, Nevada which was abandoned in 1878 after a disastrous fire. The main shaft has been dewatered and retimbered. Drifting operations are proceeding at the 1,000-foot level of the incline shaft. Sampling is being done to check the various ore bodies. The ore is principally stetefeldtite, an argentiferous antimony ore with which are combined silver, lead, copper, and iron.

An inquest was held in Silver Peak, Nevada to determine the cause of death for three miners trapped in a cave-in in the **Mohawk** mine operated by **U.S. Milling & Minerals Corporation.** The verdict of the coroner's jury: "the fact that the

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so-called 'Hinds' 202 stope had been abandoned and was not filled and that subsequent removal of pillars beneath it on the floor of the 200-foot level before and after the advent of the U.S. Milling & Minerals Corporation in June 1959, caused a cave of unbelievable force and extent, thereby crushing and/or suffocating to death the three . . . men somewhere between the 200- and 300-foot levels of the mine where the bodies are presumed now to be. It is also believed that the surface water seeping through the hanging wall of the 202 stope may have been a contributing factor." Reports of the state and federal mine inspectors agreed that no evidence of the impending disaster was indicated before the cave-in occurred, and listed heavy August rains as a contributing factor.

Walter R. Averett of Box 362, Golden, Colorado, is preparing a history of mining in southern Nevada. He is particularly interested in little-known and forgotten caps and districts, generally known only to local residents. He is seeking first-hand information from any "old-timers" about these mines and mills, and may be contacted at the above address.

Beryllium Resources Inc. has contracted for 5,000 to 10,000 feet of drilling and 2,000 feet of underground lateral work to further develop the ore bodies in its **Mt. Wheeler** property. Much work had been done by previous operators, including driving of a 4,000-foot adit, drifts, crosscuts and raises and 1,800 feet of diamond drilling. The property is located about 45 miles southeast of Ely, Nevada.

Sulphur Products Inc. of Sulphur, Nevada is currently producing about eight flasks of mercury per day from its new mill. The mill was purchased from John Etchart, and the firm is negotiating with **Wah Chang** for purchase of their 300-ton mill at Gabbs which would more than double daily output. The firm also ships soil sulphur from its property.

King's Inc., a newly organized company, is seeking financing for erection of a mill at the old Tuscarora mining camp in Elko County, Nevada. The firm claims it has stockpiled a large amount of ore containing free milling gold and silver. The properties include the **Grand Prize**, the **Wakefield** and the **Revenue.**

The **Grey Eagle** lead-silver mine near Beowawe, Nevada reportedly has been offered at public auction in a trustees' sale at Battle Mountain. Included are four patented mining claims: the **Hovendon Lode, Sunnyside Lode, Eagle Lode,** and **Wilson Lode.**

A well-illustrated 56-page booklet and map of Virginia City, Nevada and the Comstock Lode are offered by **Pages of History** of Sausalito, California for $1.50.

The **General Services Administration** is offering for sale 35,120 pounds of experimental titanium sponge having a Brinell hardness of 170 Bhn or above. The material is stored in the **U.S. Bureau of Mines'** pilot plant at Boulder City, Nevada and is offered in one lot, f.o.b. at site. The material was acquired by GSA from the Bureau of Mines under a Defense Production Act agreement. It is surplus and eligible for disposal through competitive bidding. Contact George K. Casto, c/o GSA, Washington 25, D.C.

Methods used by **Simplot Silica Products Inc.** in mining and processing silica sands at Overton, Clark County, Nevada are described in a new **U.S. Bureau of Mines publication.** The booklet is available for 15¢ from the Superintendent of Documents, Washington 25, D.C. It is Information Circular 7897

Fred Ledres of Tonopah, Nevada is reported to have discovered a lithium deposit in the Lida mining district of Esmeralda County, Nevada. Mr. Ledres holds three claims in the area.

NEW MEXICO

The **Peru Mining Company** properties which have been closed for three years are being reopened as a result of a joint venture agreement between **Hydrometals Inc.,** parent company of Peru, and **American Zinc, Lead and Smelting Company.** Development work, including drilling for additional ore reserves, has already begun. This marks American Zinc's first mining entry in the Southwest. Ore will be concentrated in Peru's plant at Deming, New Mexico, and then shipped to Dumas, Texas where **American Zinc Company's** smelter will convert the concentrates to slab zinc. The Texas smelter had been acquired by American Zinc from Hydrometals' **Illinois Zinc Company Division** in 1940.

The **Anaconda Company** has instituted a 26-week program for testing radiation levels, if any, at the Bluewater plant in New Mexico. At least one person in each area of the plant will wear a film badge clipped to his clothing. The device records on photographic film the quantity of radiation to which it is exposed. The program is designed to give a permanent record of the actual cumulative radiation exposure of individuals in all plant areas. Previously, sensitive instruments have been used to detect beta and gamma radiation.

Lance Corporation has set up a Trucking Division to haul all ore from its properties to Ambrosia Lake mills **Sabre-Pinon Corporation,** parent company of Lance, also plans to establish such a division. Both firms are making these arrangements in anticipation of the government's suspension of hauling allowances March 31, 1962.

TEXAS

Susquehanna-Western, Inc., subsidiary of **The Susquehanna Corporation,** is examining a uranium deposit in the Palangana Dome District of South Texas, near Corpus Christi. The work is being done in conjunction with the **Columbia-Southern Chemical Corporation.** Consideration is being given to construction of a 600-ton-per-day processing mill in the area.

precipitates—CENTRAL AND EASTERN

Electric Truck Slated for Delivery to Iron Range

A new 55-ton payload Diesel-electric truck is scheduled for testing starting December 7, after which it will be delivered to a mining company on the Mesabi Iron Range. The truck, built by Unit Rig & Equipment Company of Tulsa, Oklahoma, incorporates the General Electric Company's motorized wheel drive.

The Unit rig will be the second electric truck delivered to a metal mining company. The first, built by R. G. LeTourneau Company, was acquired by the Anaconda Company for use at the Berkeley open pit mine at Butte, Montana (see MINING WORLD, August 1959, page 31). The truck destined for the Iron Range differs from Anaconda's hauler in that power for the wheels will be supplied from a generator driven by a Cummins V-12 Diesel engine developing 600 horsepower at 2100 revolutions per minute. In contrast, the Anaconda truck normally will operate from a trolley system, but is equipped with a small Diesel engine so that it can maneuver around bench shovels and dump points while disconnected from the trolley.

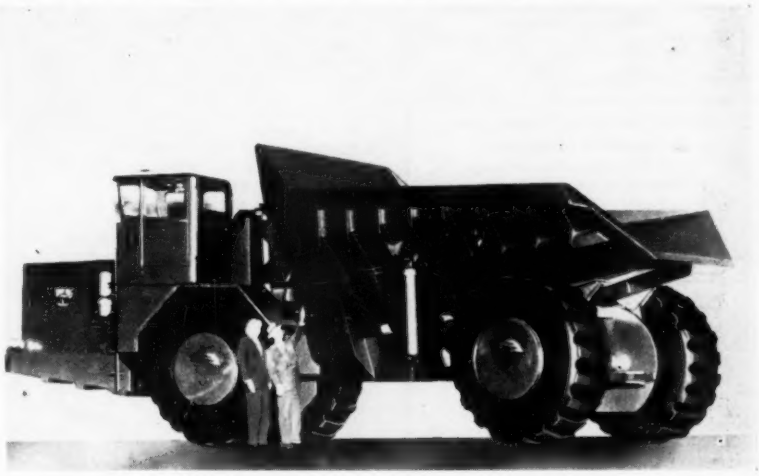
The Unit Rig model has overall dimensions of 41 feet 6 inches in length, 14 feet in width, and 14 feet 10 inches in height. The bowl behind the tractor is 21 feet long, 13 feet wide, and has a maximum depth of 7 feet. It provides a capacity of 36 yards struck and over 42 cubic yards heaped. Ground clearance of the trailer frame is 2 feet 3 inches. The shovel dumping height with standard 37.5 x 33-42 tires is 11 feet 6 inches. The tires are Nylon and tubeless.

The truck will be equipped with four motorized wheels, each containing its own integral electric motor and gear drive arrangement. The entire motor is mounted within the rim which, in turn, is bolted to the side of the vehicle. Industry has high hopes that the electric trucks will be able to negotiate steeper grades (up to 15 percent) at greater speeds, thereby cutting haul cycle time and road maintenance expense.

The truck will feature dynamic braking on all four wheels, utilizing the full horsepower capacity of the wheel motors as generators. The energy of motion is dissipated into air-cooled resistors during the braking cycle.

The truck will feature hydraulic power steering, and is said to be capable of negotiating a 180° turn in 50 feet. The bowl will be dumped by a pair of 3-stage telescoping cylinders. The wheel base of the truck is 21 feet. The gauge, center to center front tires, is 9 feet 9 inches. Gauge, center to center rear tires, is 10 feet 9 inches.

The motorized wheel drive eliminates the need for axles, transmissions, differentials, and drive shafts.



CENTRAL STATES

First gypsum ore has come from the **U.S. Gypsum Company**'s new mine at Sperry, Iowa, although regular mining operations are not scheduled to begin until early spring of 1960. The two 600-foot-deep vertical mine shafts were sunk by **Western-Knapp Engineering Company**. WKE is also doing the initial mine development work, as well as the engineering and construction of surface facilities. About 15,000 tons of gypsum will be removed through the ventilating shaft as miners develop the drifts connecting with the main shaft 300 feet to the north. The ore will be stockpiled until the plant goes into operation next year.

The **Piquette** mine and mill at Tennyson, Wisconsin have been reactivated and placed in full production. The property has been idle since December 1957, when low base metal prices made operation unprofitable. An annual rate of 6,000 tons of zinc concentrates and 600 tons of lead concentrates will be maintained. The property is a joint operation of **Piquette Mining and Milling Company** and **American Zinc, Lead and Smelting Company**. American Zinc is also reopening other mines and milling facilities in southern Wisconsin.

Freeport Sulphur Company's capital expenditures this year will be about $10,500,000, most of which is for the company's off-shore sulphur mine at Grand Isle, Louisiana. Annual capacity of this mine will be about 1,000,000 tons. It is scheduled to go into production in the first half of next year. The Bay Ste. Elaine mine (also Louisiana) has a yearly output of 200,000 tons, but this is expected to be exhausted soon.

American Zinc, Lead & Smelting Company and **Hydrometals Inc.** have signed a long-term agreement for joint activity in two areas. One involves American Zinc's electrolytic plant at Monsanto, Illinois where 8,000-pound ingots of Hydro-T-Metal will be cast on a semi-continuous basis. (This is Hydrometals' new alloy of titanium, copper, and zinc.) The ingots will go directly to the rolling and extrusion mills of the **Dow Metal Products Company** at nearby Madison, Illinois where they will be rolled into coils of sheet metal or will be extruded. The other venture is for joint development of the mineral resources of **Peru Mining Company**, Hydrometals' subsidiary in Silver City, New Mexico. The properties include a concentrator at Deming which has not been operating for the past three years because of low zinc prices. The concentrates to be produced by the joint venture will be converted into slab zinc at American Zinc's Dumas, Texas smelter, which was acquired from Hydrometals in 1940. This will be American Zinc's first mining operation in the Southwest.

EASTERN STATES

The **American Zinc Company of Tennessee**, a wholly owned subsidiary of **American Zinc, Lead and Smelting Company**, has reactivated the **Grasselli** mine at New Market, Tennessee, and it is expected to be in full production by the end of this month. The property has been idle since December 1957 because of low prices for base metals. Annual production will be about 9,000 tons of 60 percent zinc concentrates.

Glidden Company has acquired a large deposit of ilmenite ore in Ocean County, New Jersey, from **American Metal Climax Inc.** A concentrating and separating plant will be built on the property, and it should be completed by late in 1961. The property is near the Lakehurst Naval Air Station, and is said to represent a 20-year supply of ore at the Chemicals-Pigments-Metals Division's current operating level.

New and improved scrubbers added to the waste control equipment at **Coronet** phosphate processing plant have removed 97 to 99 percent of the impurities, mostly fluorine, from exhaust gases, according to R. M. Wilbur, general manager of **Smith-Douglass Company Inc.** The firm has spent about $750,000 in research over the past few years to recover the fluorine naturally present in Florida's phosphate rock, and to convert it into a salable product. The new system consists of washing the exhaust gas stream four times with high pressure water sprays to recover the fluorine in solution. The gas stream then is completely neutralized with limestone so that no free fluorine is present in the gases vented to the atmosphere. It is then chemically processed and converted into industrial products.

A new **Office of Health and Safety** has been established by the **U.S. Atomic Energy Commission.** Functions and personnel of two branches of the Division of Biology and Medicine—the Health Protection Branch and the Radiation Effects of Weapons Branch—and the Safety and Fire Protection Branch, **Office of Industrial Relations,** have been transferred to this new office. It has primary responsibility, in cooperating with other AEC offices and divisions, for developing and recommending health standards for the protection of workers and the public from atomic energy radiation. It will serve as a focal point for AEC relationships with officials of state governments in the area of radiation protection, and will have the additional responsibility of developing policies and recommending standards for protection of personnel in AEC operations from non-nuclear, as well as radiation hazards. Dr. Forrest Wester is Acting Director of the new office.

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IRON RANGES

Plans for erection of the **Sherman** concentrator near Chisholm, Minnesota have been approved by the management of the **Oliver Iron Mining Division, U.S. Steel Corporation.** The intended facilities will be erected adjacent to the present Sherman rescreener and will include washing, heavy media, cyclone, and spiral sections. Annual concentrate output is to be 1,500,000 gross tons. Current plans indicate that the building will start in March 1960, with operations scheduled for spring 1961.

Four large ore washing plants operated by **Cleveland-Cliffs Iron Company** on the Mesabi Range will not be reopened this winter, despite the injunction issued in the steel strike. The advent of freezing weather is responsible. Workers called back will be used for repair work, and in ore stripping operations. The plants are at Nashwauk. Marble, Coleraine, and Taconite.

The president of **Inland Steel Company,** John F. Smith, Jr., has forecast a record steel output of 125,000,000 tons of ingots in 1960. He estimates that the largest demand will come from the automobile industry which he belives will build 6,800,000 passenger cars and 1,300,000 trucks. By 1973, he sees an industry ingot capacity of 170,000,000 tons.

First job undertaken at the **Sunday Lake** mine of **Pickands Mather & Co.** after the strike injunction was issued was to complete necessary maintenance work in the Brotherton shaft. This work delayed recalling all of the miners but re-railing was considered necessary to insure safety. The shaft is 2,700 feet deep. The firm reports it asked the union to allow the work to be done during the strike but the proposal was rejected.

The largest U.S. ore carrier on the Great Lakes was launched November 7. Built for **Bethlehem Steel Company,** the new carrier is 730 feet long, with a carrying capacity of more than 25,000 gross tons. It was named for the company's president, Arthur B. Homer.

Snyder Mining Company has hired **Atkins-Walker Company** of Duluth, Minnesota to drill its taconite property in the Butternut area of Ashland County, Wisconsin. Snyder explored in the area last year, and optioned property north of the town of Butternut early this summer.

The St. Louis County (Minnesota) Board of Commissioners has authorized the sale of 2,590 acres of land in the Mt. Iron area forfeited by former owners for non-payment of taxes. The sale will be held on December 7 at 10 a.m. in the County Board Room in the County Court House at Duluth. It is expected that the **Oliver Iron Mining Division** of **U.S. Steel Corporation** will bid for the land as a possible site for a taconite plant. While no specific plans for such a plant have been announced, it is believed to be a part of the firm's long-range planning.

COMING CONVENTIONS

December 4 and 5. Annual Convention of the NORTHWEST MINING ASSOCIATION, Davenport Hotel, Spokane, Washington.

February 14 through 18, 1960. Annual meeting of the AMERICAN INSTITUTE OF MINING, METALLURGY, AND PETROLEUM ENGINEERS. Statler Hotel, New York, New York.

March 17, 18, and 19, 1960. NATIONAL WESTERN MINING CONFERENCE, sponsored by the Colorado Mining Association and affiliated groups. Denver Hilton Hotel.

April 21, 22, and 23, 1960. SOUTHWEST METALS AND MINERALS CONFERENCE, sponsored by the AIME and the Rock Products Association of southern California, Ambassador Hotel, Los Angeles, California.

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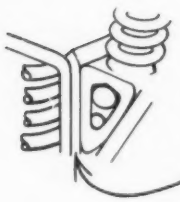
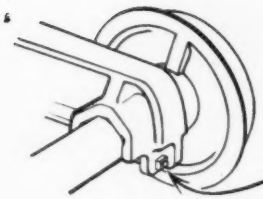
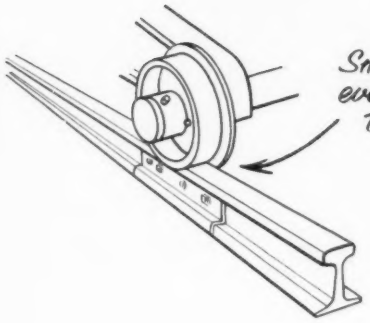


Movement between bolster and side frame is taken on specially designed wear surfaces



Quick wheel change



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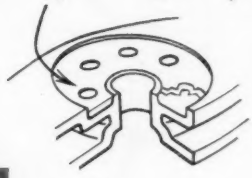

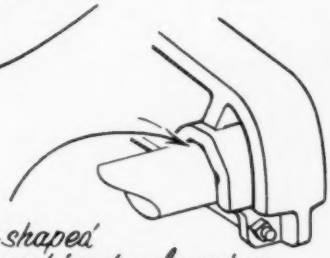

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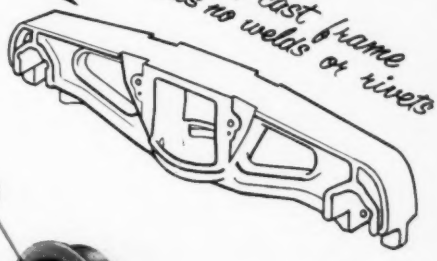

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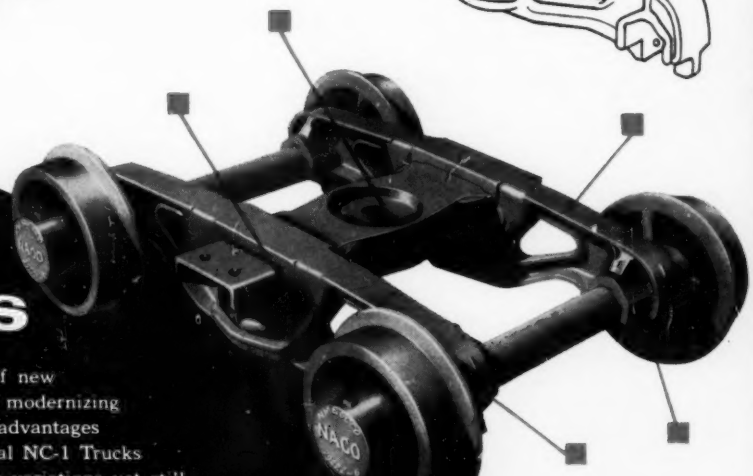

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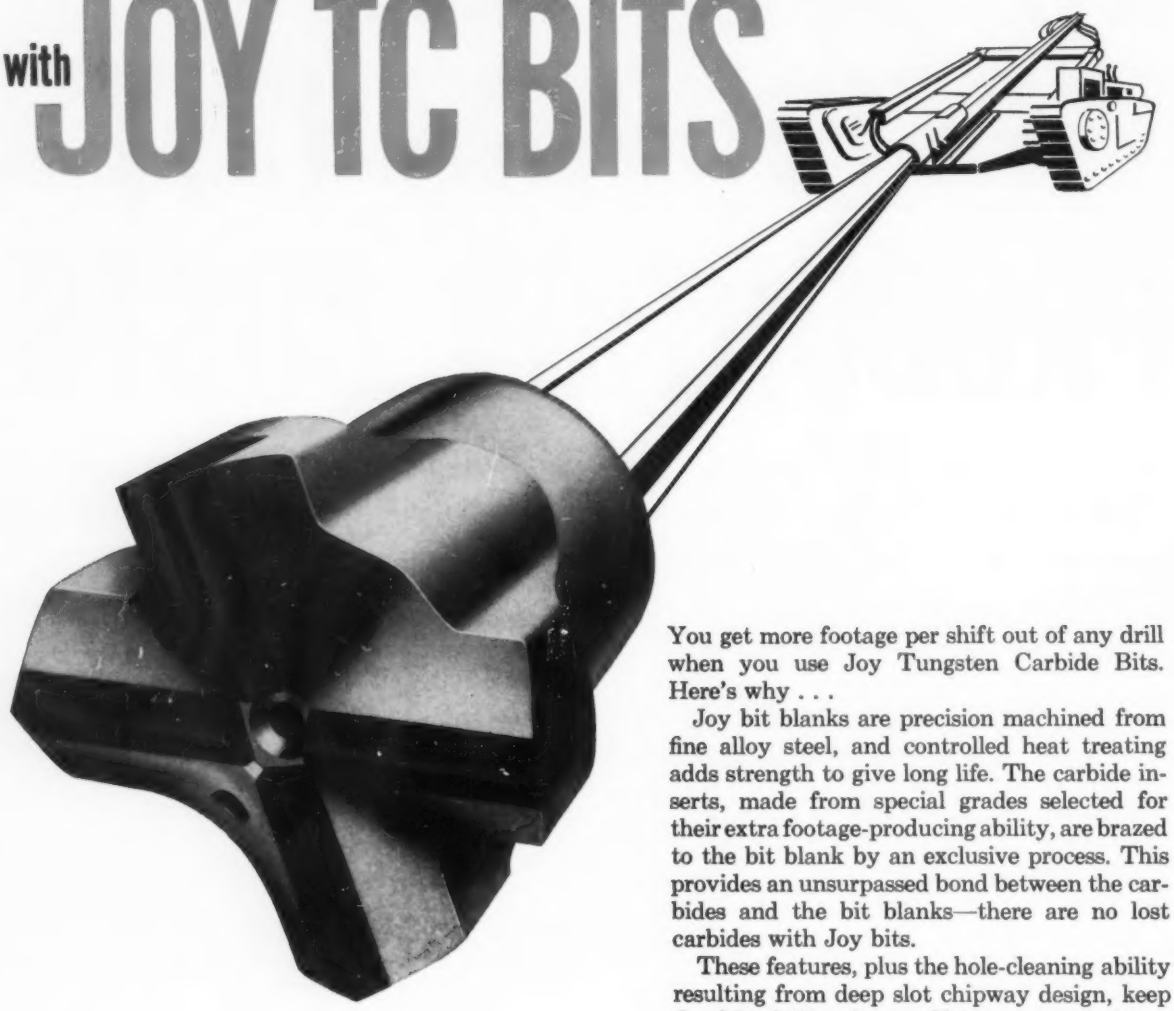

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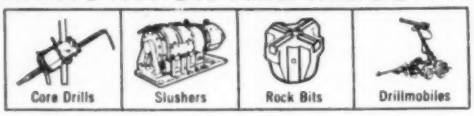

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364-774

NEWSMAKERS IN WORLD MINING

Dr. L. C. Tyte, director of the Isteworth Research Establishment of the National Coal Board of England, recently in the United States to attend a mining safety convention in Pittsburgh, Pennsylvania, lectured at the Colorado School of Mines, and the student chapter of the American Institute of Mining, Metallurgical and Petroleum Engineers.

Two Stanford Research Institute mineral-process engineers have been assigned overseas to give technical assistance to the Nigeria and India minerals industries. **Frank M. Hruz** is leaving the Menlo Park, California, headquarters of SRI for India, and **Eldon P. Farley** is enroute to Nigeria. Mr. Hruz will spend a year in India making techno-economic surveys of the minerals and metals industries. His surveys are being supported by the India National Council of Applied Economics Research for use in the expansion of these industries. Mr. Farley, a clay specialist, will evaluate Nigerial clay deposits and assist in establishing a clay industry. His work is part of a Nigerian Technical assistance program.

R. B. Hagart, of the Anglo American group, has been appointed a director of Johannesburg Consolidated Investment Company, Ltd., Union of South Africa; **D. A. B Watson** has been appointed deputy-chairman of the J. C. I. Company, following many years of association with the group.

A. Royden Harrison has been appointed a director of Spring Mines, Ltd. and of Western Holdings, Ltd., Union of South Africa, in place of **G. W. Pooley,** resigned.

William Swain, chief geologist for The Anaconda Company in Chile, has been transferred to the United States. He was in charge of the El Salvador exploration project and Anaconda's exploration program for northern Chile for the past eight years.

E. K. McDermott has been appointed chairman, and **G. D. Ballance** a director of Apex Mines, Ltd. and to the same positions on the Board of Rooiberg Minerals, Ltd., Union of South Africa.

Russell F. Kohn is now manager of Marcona Mining Company's iron ore mines and beneficiation plant at San Juan, Peru. He formerly was superintendent, processing plants, for Erie Mining Company at Hoyt Lakes, Minnesota.

The Anglo American Corporation of South Africa Limited has recently made the following appointments: **R. A. Mudd,** assistant consulting engineer; **A. R. McLeod,** manager of President Brand mine; **R. J. Adamson,** consulting metallurgist to succeed **C. Stent** who retired; **E. T. Pinkney,** consulting chemical engineer; **J. H. Mortimer,** assistant consulting engineer; and **G. Langton,** assistant consulting chemical engineer.

D. W. Pringle, former manager at Western Nickel Company, Ltd., Hope, British Columbia, is now general superintendent, Howe Sound Company, Britannia Division, Britannia Beach, British Columbia, Canada.

L. G. THOMAS

E. P. CADWELL

Leonard G. Thomas, partner in Lottridge-Thomas and Associates, professional engineers of Salt Lake City, Utah, who have been engaged by Interamerican Mining Corporation, Panama, to evaluate South American mining prospects, is travelling to Lima to appraise copper properties in Central Peru. After a stop in La Paz, Bolivia, he will proceed to Rio de Janeiro where he will examine diamond and other mining operations in Brazil.

Edward P. Cadwell, former field engineer of Lima, Peru, has been promoted to chief metallurgist for Cyanamid International with headquarters in New York. Mr. Cadwell has been Cyanamid's technical representative to South America's mining industry since 1948.

D. J. Holliday has been appointed a director of Simmer and Jack Mines, Ltd., Union of South Africa, in place of **W. M. Walker,** who resigned to take chairmanship of Vlakfontein Gold Mining Company, Ltd. and directorship of Venterspost Gold Mining Co., Ltd.

Donald P. Douglass, executive officer of the Ontario Department of Mines, Canada, has been promoted to assistant deputy minister. A native of New Brunswick and engineering graduate of the University of New Brunswick, Mr. Douglass has been with the Department of Mines for 22 years. He joined the staff after working at Coniaurum Mines and later became senior electrical inspector of mines before becoming the department's executive officer in 1952.

C. P. Young, assistant general manager of the British phosphate commissioners in Melbourne, Australia, and **R. B. Tennent,** New Zealand phosphate commissioner, were recent visitors at International Minerals & Chemical Corporation, Bartow, Florida. They visited IMCC's Noralyn mines and plant, the Bonnie plant, and the research program conducted at the Mulberry experiment station.

H. G. Frommurze, assistant director of the Geological Survey of the Department of Mines, Union of South Africa, has retired after 38 years of Government service.

M. G. M. Atmore, of the Anglo American Group, has been seconded to the South African Atomic Energy Board as its chief metallurgist to assist in planning and organizing improvements in the methods of recovering and up-grading uranium oxide.

M. G. Wilson, mine manager of the South African Manganese, Ltd. of Cape Province, South Africa, and **U. V. Glatthaar,** mining engineer for the African Metal Corporation, Ltd. of Johannesburg, South Africa, were recent visitors at St. Joseph Lead Company, Bonne Terre, Missouri.

A. G. McAdam, formerly underground manager at Broken Hill Company, Northern Rhodesia, is now relieving underground manager at Nchanga Consolidated Copper Mines, Nchanga, Northern Rhodesia. Mr. McAdam received his B.Sc. degree from Witwatersrand University, after which he worked for Geduld Proprietary Mines, Ltd. and H. H. Fraser in the Union of South Africa.

C. S. McLean, technical director and deputy chairman of General Mining and Finance Corporation, will be president of the Seventh Commonweath Mining and Metallurgical Congress to be held in Southern Africa. Vice presidents will be **W. S. Findlay** of Johnnesburg Consolidated Investment; **Sir Ronald Prain** of Rhodesian Selection Trust for Northern Rhodesia; and **Sir George Davenport,** Minister of Mines, for Southern Rhodesia.

Dra. Blanca G. de Wappner, fluorescent X-ray analyst for Minerals for the Atomic Energy Commission of Argentina, and **Miss Maria H. Falabella** of the National Nuclear Energy Commission of Brazil, are completing tours of training with the United States Department of the Interior's Geological Survey. Dra. de Wappner's studies are sponsored by the National Council of Scientific and Technical Research of Argentina; Miss Falabella's, under the auspices of the United States State Department's International Cooperation Administration.

Gordon A. Tait, formerly area manager for Kancol Gold & Base Metal Mines, Jos, Nigeria, is now inspector of mines in Nairobi, Kenya, where his address is P. O. Box 30,009.

A. Olaf Wolff has been appointed director of research and development of the Consolidated Mining and Smelting Company of Canada, Ltd., Montreal. In his new position, Mr. Wolff will co-ordinate the firm's technical research and development, market research and commercial development.

Dr. T. E. Allibone, a director of the Associated Electrical Industries Research Laboratory in the United Kingdom, recently visited the Union of South Africa to give the 9th Bernard Price Memorial Lecture to a joint meeting of the South African Institute of Electrical Engineers and the University of Witwatersrand. He spoke on "Fission and Fusion".

E. K. Mc Dermott, consulting engineer in South Africa to the Anglo-French Exploration Co., Ltd. has been appointed manager in South Africa and chairman of Apex Mines, Ltd. and Rooiberg Minerals Development Co., Ltd. which are administered by the Anglo-French Company, in succession to the late **A. W. Stewart.**

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INTERNATIONAL NEWS

AEC To Curtail Canadian Uranium Purchases; Stretch Out Present Contracts Thru 1966

The United States Atomic Energy Commission has announced that it will not purchase any Canadian production of uranium concentrates beyond the amounts already scheduled for delivery under firm contracts which are set to expire in March 1962 and March 1963. In effect, the AEC will not be in position to exercise the options that it held on Canadian production of uranium concentrates in the post contract period. An oversupply of concentrates beyond the amounts required by the AEC was cited as the reason for the decision reached jointly with the Canadian government.

The announcement was hailed by certain domestic producers of uranium concentrate, but was regarded as a blow in Canadian quarters.

To soften this blow on the Canadian economy, the AEC agreed to a stretch-out plan whereby certain portions of the contracted deliveries could be deferred through 1966. Under the stretch-out plan, the total tonnage of Canadian concentrate deliveries now under contract will remain unchanged. This is estimated at approximately 40,000 tons of concentrate worth in the neighborhood of $1,000,000,000 at present schedules of payment. The amount of concentrate involved under the deferred delivery plan was not revealed.

Because the deferred production had been counted upon by Canadian companies to provide amortization payments due in the pre-1962 period, an advance payment of $2.50 per pound of U_3O_8 will be made by the AEC to Eldorado Mining & Refining Company, a Canadian Government corporation with respect to each pound deferred. The advance payments will be made at approximately the same time as the delivery of the uranium would have been made had there been no deferment.

The new plan also provides for a single contract with Eldorado Mining & Refining for delivery of uranium. Previously the AEC had a separate contract with Eldorado for each contract that Eldorado had with a Canadian uranium producer.

The latest AEC announcement will not affect domestic deliveries of uranium under contracts negotiated with United States companies.

NORTH AMERICA

QUEBEC — **Quebec Cartier Mining Company** has awarded a second contract for construction of housing, roads, and public services in its new mining town of Gagnonville, 100 miles northwest of Sept Isles. This, like the first contract, also went to **Hill-Clark-Francis (Quebec) Ltd.** Housing is scheduled to be ready by summer 1960, while remainder of the project is to be ready for use next fall. Some 60,000 tons per day are to be sent to the huge new concentrator starting in 1961. The **Lac Jeannine** deposit is estimated to contain 400,000,000 tons of open-pit ore and is only one of the smaller of six ore bodies.

NORTHWEST TERRITORIES—**Eldorado Mining and Refining Ltd.'s** interest in a series of anomalies near the Wompay River has led other mining companies into prospecting the area. Eldorado has staked 1,000 claims along the 70-mile greenstone sedimentary belt which follows the course of the river. The ore reportedly is bornite. Several companies got into the area before freeze-up, and others will probably follow after the ice is thick enough to support planes. The Byrne organization has taken 98 claims through three of its companies and 72 claims were purchased for three others. **Consolidated Northland**, one of the firms, reports that bornite, silver, and molybdenite were found in preliminary prospecting.

SASKATCHEWAN—**International Minerals & Chemical Corporation** has had to freeze the water-impregnated Blairmore sands at the 1,200-foot level of its potash mine in order to continue shaft sinking. Sinking operations were at a virtual standstill for about a year because of repeated floodings. Chemical grouting was tried but did not prove successful. The mine is now expected to go into productin late in 1960 or early 1961. Surface construction has been progressing. The headframe and hoist house are completed; also a warehouse and ammonia freezing plant. Administrative and engineering staffs are located in their new quarters, and an airstrip is in operation. The mill building is more than 60 percent finished, and two storage bins, a coarse ore bin, and loading dock are about completed. All buildings will be connected by weatherproof underground tunnels.

BRITISH COLUMBIA—After 21 months of underground development and extensive sampling, **Bethlehem Copper Corporation** has issued a revised picture of its ore situation. The largest zone is the Jersey, estimated to contain 48,500 ton per vertical foot grading 0.70 percent copper per ton. The East Jersey zone has an estimated 15,890 tons per vertical foot averaging 1.15 percent copper per ton. From surface to the 4,600-foot elevation (about 260 feet), the Jersey zone is estimated to contain 12,600,000 tons averaging 0.7 percent, and the East Jersey from surface to the 4,600-foot adit (350 feet) about 5,500,000 tons grading 1.15 percent. Small amounts of gold, molybdenum, and silver also have been found in two zones.

MANITOBA—Plans have been formulated by **New Manitoba Mining and Smelting Company** for establishment of a completely integrated operation to handle output from its nickel-copper property in the Bird River area, 100 miles northeast of Winnipeg. The mine will be reopened around the first of the year. First concentrates are expected to be ready for the new acid plant by April, when the 50-ton-per-day plant is expected to go into operation. **Border Chemical**, holding 25 percent of New Manitoba's stock, will build the acid plant. A 1,000-ton mill is already on the property, and New Manitoba will build a leaching plant. **Westcan Iron Corporation Ltd.** will build a pig iron plant nearby. The operation is to work this way: The acid plant will receive concentrates from the mine; it will roast them and recover the sulphur gases to make sulphuric acid. The roasted concentrates, or calcines, will then go to the leaching plant where copper and nickel will be precipitated out as salable oxides. The leached calcines will then move to the pig iron plant where an **Electrokemisk** furnace will treat 42,000 tons of iron calcines annually to produce 60 tons of pig iron per day or 21,000 annually. **Chemical Construction Corporation** of New York has already received the design and engineering contract for Border Chemical's 50-ton sulphuric acid plant.

BRITISH COLUMBIA—**Baroid of Canada, Ltd.**, subsidiary of **National Lead Company**, has taken a $300,000 purchase option on the **Spillimacheen** properties of **Giant Mascot Mines, Ltd.** The agreement gives it the right to produce barite concentrates on payment of a minimum annual royalty of $20,000 per year for 10 years at the rate of $2 per ton of concentrates produced, plus 10 percent of net smelter returns from other metals recovered.

ONTARIO—**Pater Uranium Mines Ltd.** has sold its **Spragge** copper property in the Elliot Lake-Blind River district to **Pronto Uranium Mines**, paving the way for development of the property. Pater was organized in 1953 to acquire mining claims in the Spragge township. Sufficient commercial uranium was not found, but copper and cobalt mineralization were. A three-compartment shaft was sunk to 1,032 feet and crosscutting, drifting, and diamond drilling on the 950 level outlined a copper ore zone about 1,000 feet in length with an average width of nine feet. From this work it was estimated that about 1,000,000 tons of approximately 2.0 percent copper existed in the ore body. Pater did not feel the propery warranted erection of a mill; Pronto, however, had milling facilities only three miles away, and this mill will be reconverted for treatment of copper ore. This and other work, including rehabilitation of the mine and erection of new facilities, is expected to cost about $900,000.

AFRICA

FEDERATION OF RHODESIA & NYASALAND—**Bikita Minerals (Private) Ltd.** has developed an extensive deposit of high-grade pollucite ($CsSi_2Al0_4$) at its property near Fort Victoria, Southern Rhodesia. The ore is reported to average 24.4 percent cesium oxide, and is part of the lithium-beryllium reserves Bikita has been developing for some time. (See MINING WORLD, June 1959, page 28 for a summary of world-wide cesium activity.) Bikita is owned by **Selection Trust Ltd., American Potash & Chemical Corporation**, and **American Metal Climax Inc.** American Potash produces cesium metal and cesium compounds at San Antonio, Texas.

INTERNATIONAL

FRENCH WEST AFRICA—The Spanish government has refused to allow **Mines de Fer de Mauritanie (Miferma)** to build its railroad 330 miles across the Spanish colony of Rio del Oro from Fort Gouraud in Mauretania to Port Etienne on the Atlantic Coast. The line was to be built at a cost of $116,000,000 to transport ore from the mine to a shipping port. Miferma, in turn, declined the Spanish government's proposition that the rail line be built from Fort Gouraud across Rio del Oro to the shallow port of Villa Cisneros. This would have cost an additional $15,000,000 in order to deepen the Villa Cisneros harbor for ocean-going vessels. Spain had been offered from 4.5 to 8 percent participation in Miferma if she permitted the railroad. Miferma is now reported to be inviting bids for construction of a railroad which will bypass the Spanish colony and remain on Mauretanian territory.

UNION OF SOUTH AFRICA—**Hartebeestfontein Gold Mining Company Ltd.**, presently sinking the No. 2 and 3 shaft systems, is now advancing work preparatory to sinking of No. 4 in the southeastern section. Located in the deep level section of the mine about 1,000 feet north of the southern boundary, the No. 4 will be sunk to a depth of 7,500 feet below the surface. The No. 4 will be a 24-foot lined-diameter, hoisting unit which will be equipped after hoisting. It will be connected with the No. 2 shaft workings which are about 8,000 feet to the northeast. Because the shaft is near the southern boundary, it could facilitate exploratory development into the extreme eastern section of the **Zandpan** lease area; southward into ground not included to date in any lease and lying between the mine and the **Vaal Reefs** property, and possibly even into the extreme northeastern section of Vaal Reefs itself.

UGANDA—Operating results and earnings at the **Kilembe** mine of **Kilembe Mines Ltd.** show an increase in throughput for the six months of 1959, from 45,000 tons per month to 60,000 tons per month. This was accomplished by adding to the flowsheet a 500-ton-per-day milling unit for oxide ore.

FEDERATION OF RHODESIA & NYASALAND—**Mufulira Copper Mines Ltd.'s** concentrator expansion now under way will bring the daily milling capacity up by 50 percent, to over 20,000 tons a day. A new tailing dam to impound tailing will utilize hydrocyclones for wall building. Originating at **Roan Antelope** in 1951, this system has been widely adopted on other mining fields, particularly in southern Arizona.

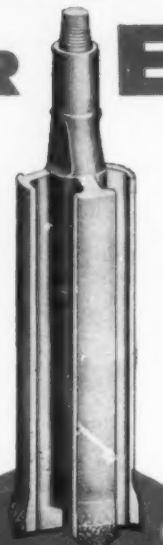
MADAGASCAR—A new firm has been formed to develop monazite sands in the southern part of the island. The **French Commissariat a l'Energie Atomique** is sponsor of the firm. It is hoped that eventual annual production will be about 1,500 tons of monazite, 30,000 tons of ilmenite, and 1,800 tons of zirconium from 100,000 tons of ore treated.

TANGANYIKA—Two prospecting teams of the Tanganyika government have systematically searched for additional lead ore reserves for **Uruwira Minerals Ltd.** over the past year. These teams have now been withdrawn, apparently without any successful results, so it is expected that the remaining life of the mine will not be more than a year.

UNION OF SOUTH AFRICA—**New Consolidated Gold Fields Ltd.** has taken up options on about 86,400 claims immediately south of the present "West Wits" line, noted for such gold mines as **Blyvooruitzicht, West Driefontein, Doornfontein,** and **Western Deep Levels.** New Consolidated will drill the area to determine whether the economic reef horizons mined by these other mining firms to the north of the property continue at mineable depths into the optioned land. The option area is believed to lie almost completely below the overlying Transvaal System of dolomites and lavas, but may be upcast by faulting to economic depths. There are no outcrops in the area.

FRENCH WEST AFRICA—**La Societe des Mines de Cuivre de Mauritanie (Micuma)** has placed in operation a pilot plant for treating copper oxides of the **Akjoujt** mine, 225 miles southeast of the Atlantic Coast harbor of Port Etienne. A pilot plant for treatment of the copper sulphides was operating in 1955. (See MINING WORLD, September 1955, page 87). The ore is estimated to average about 3.0 percent copper and contains approximately 3 grams gold per ton. The pilot plant will treat 70 tons of ore per day to produce a 65 percent copper concentrate, containing 60 grams of gold per ton. Results of this operation will determine type of large-scale plant to be built later.

FABRICATED STAR BITS



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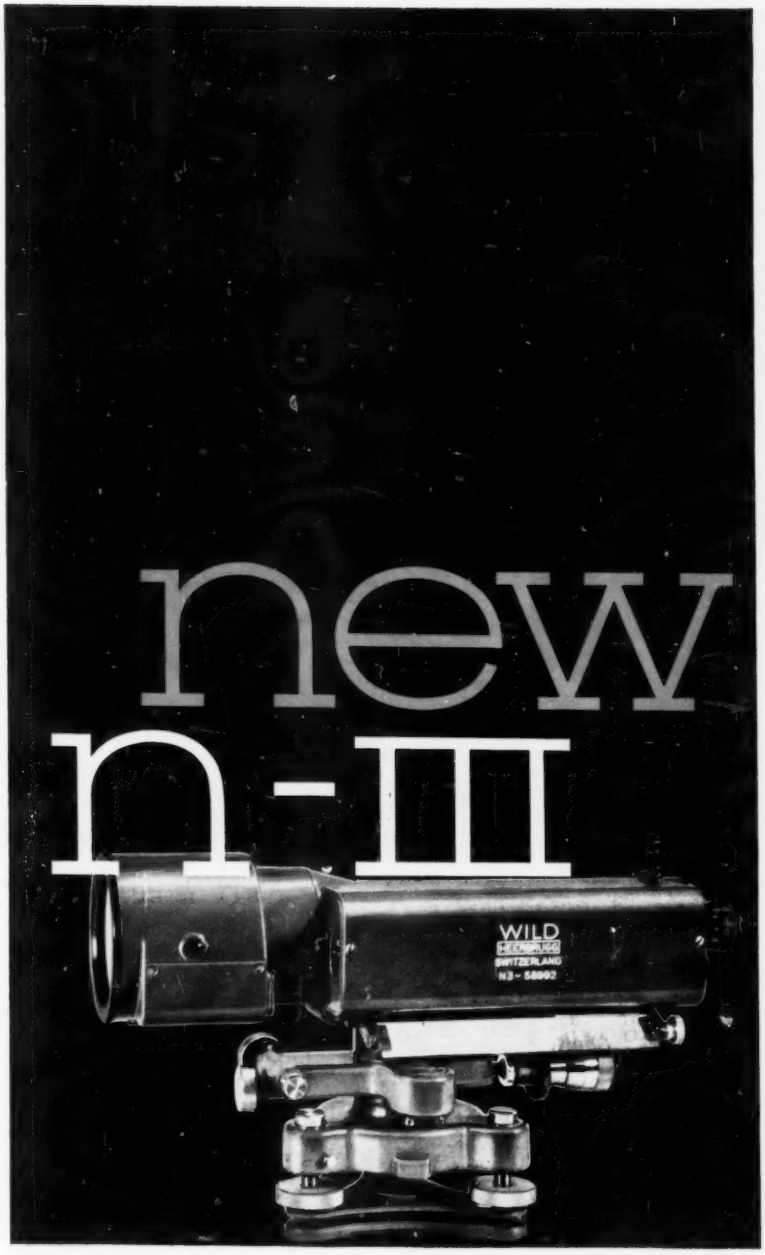
UNION OF SOUTH AFRICA—A further outlet for the production of ilmenite concentrates by **Umgababa Minerals Ltd.**, which is already supplying considerable quantities to plants operated by the **British Titan Products** group in the United Kingdom, is to be provided within the Union itself. The British Titan firm, in association with **African Explosives and Chemical Industries Ltd.**, will erect an ilmenite processing plant near Durban. It will have a capacity of 10,000 tons a year, and is part of a world-wide program of expansion by the firm. It should be completed by 1962.

AUSTRALIA—The Australian government reportedly will lend up to £20,000,000 toward an estimated £30,000,000 needed to improve the Mount Isa-Townsville-Collinsville Railway. The Queensland government would lend the remainder. The project is considered of great benefit to the entire country. Particularly, it would enable **Mt. Isa Mines** which produces copper, lead, zinc, and silver to double its output.

REPUBLIC OF THE PHILIPPINES—Production figures in September for several of the mining companies was reported as follows: **Philex Mining Corporation** milled 52,461 dry short tons of disseminated copper ore at its Santo Tomas II plant to yield 533,624 pounds of copper and 900 ounces of gold; **Benguet Exploration Company** milled about 1,036 tons of ore for a recovery of 533 ounces of gold; **Atlas Consolidated Mining and Development Corporation** treated 333,737 tons of ore at its Toledo mill with an average grade of 0.62 percent copper, yielding 7,026.2 dry short tons of concentrates assaying 26.67 percent copper and 0.120 ounce gold per ton; **Marinduque Iron Mines** treated 8,178 dry tons of milling grade copper ore at the Bagacay mill on Samar, producing 1,022.94 dry metric tons of copper. The mill at Sipalay in Occidental Negros treated 122,494 dry metric tons of ore with an average copper content of 0.79 percent, yielding 2,961.18 dry metric tons of copper concentrate. Molybdenum production at the Sipalay mill consisted of 12.390 dry metric tons of concentrate. Produced at Taluntunan, Marinduque, were 2,963 wet metric tons of iron ore with an average assay of 57.01 percent.

NORTHERN TERRITORY — **Peko Mines N.L.** at Tennant Creek showed a reduction in ore reserves for the year ended June 23, 1959. Last year reserve was 1,017,000 tons at 6.71 percent Cu. It is now 1,006,000 tons at 6.3 percent Cu. The company is drilling other prospects in the field (known as the Warramunga mineral field) and has selected the **West Gibbet, Olive Wood, Big Ben,** and **Explorer VI** for closer attention.

NEW GUINEA—**Australian Gold Development N.L.** states that its New Guinea property, being drilled in conjunction with **King Island Scheelite N.L.**,



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INTERNATIONAL

contains a large body of potential ore. There is no actual report of drilling progress.

INDONESIA—Indonesia is still said to be interested in processing its own tin ore in order to be independent of foreign smelters. The Japanese reportedly made a bid for construction of a tin smelter with an annual capacity of 25,000 tons tin metal. Proposals for construction were also sought from the United States, West Germany, and the Soviet Union. No decision has yet been reported. A contract with the Dutch government for processing is due to expire next May.

NEW CALEDONIA—Iron ore from Prony imported into Australia increased from 234,000 metric tons in 1957 to 295,110 metric tons in 1958. Output of chrome ore, mostly from Tiebaghi, dropped from 64,200 tons to 47,393 tons. The first electric furnace for producing ferronickel was started by **Societe Le Nickel** in the second half of 1958, and the second furnace went into operation early in 1959. The cobalt washing plant at Moneo is now treating 20,000 tons of ore per month. Concentrates, about 2.5 percent cobalt, are being treated by Societe Le Nickel at Noumea.

REPUBLIC OF THE PHILIPPINES —**G.Y. Ornopia & Associates Inc.** of Cebu City advises that it is undertaking development of a recently discovered iron ore deposit at Talamban. The deposit is said to be localized in a zone about 200 feet wide and about 1,900 feet long, with an undetermined depth. The exposed ore is mostly specular hematite with small amounts of magnetite. The greater part of the deposit carries about 55 to 62 percent iron.

NEW ZEALAND—The **Fourth Triennial Mineral Conference** was held at the **School of Mines, University of Otago,** at Dunedin under the chairmanship of Gordon J. Williams, Dean of Faculty of Technology. The 70 papers presented covered a wide range of subjects, from titaniferous ironsands on the western beaches, to extraction of lithium from geothermal stream.

SOUTH AUSTRALIA—A notable contribution to Australia's future mineral potential is the establishment of the **Australian Mineral Development Laboratories** in Adelaide. The South Australian Mines Department has operated two laboratories for some years which have undertaken pilot plant work for many industries. Notable success was achieved with extraction of uranium oxide from complex occurrences. These laboratories will come under the control of the new Development organization. There will be guaranteed subsidies totalling £225,000 per year, and their facilities will be available to all Australian companies and individuals at a set scale of fees. The labs will be controlled jointly by the South Australian and Federal governments, and the newly formed **Australian Mineral Industries Research Association.**

NEW SOUTH WALES — **Tungsten Consolidated Ltd.** has taken a 40 percent interest in **Nullamanna Sapphires Pty. Ltd.,** operating near Inverell. The property is alluvial and is equipped for continuous production. Ore reserves so far give a life of 10 years at a rate of about 30 ounces of cuttable gem material weekly.

UNITED KINGDOM—The **Rio Tinto Company Ltd.** and **Dow Chemie Aktiengesellschaft**, a Swiss subsidiary of **Dow Chemical Company**, have acquired control of **Thorium Limited** from **Imperial Chemical Industries** and **Howards of Ilford.** Thorium Ltd. is the principal processor of crude thorium materials in the United Kingdom and has its plant at Widnes, Lancashire. It supplies most of the U.K.'s need for refined thorium oxide and salts, and also exports these materials. A variety of cerium and rare earth compounds are also produced. Rio Tinto and Dow are associated in a Canadian venture, **Rio Tinto Dow Ltd.**, where a thorium plant, the first of its kind, went into production in May 1959. The plant uses a solvent extraction process.

YUGOSLAVIA—Large deposits of lead and zinc reportedly have been found in the **Trepca** lead mine near the Albanian frontier. Some 2,640,000 tons containing about 150,000 tons of lead and 120,000 tons of zinc, worth about $200,000,000, are estimated. Additional prospecting in the entire region is now underway.

SPAIN—A new £500,000 addition to the sintering plant of **Empresa Nacional Siderurgica S.A.** at Aviles is being supplied by **Head Wrightson Iron & Steel Works Engineering Ltd.** The new plant will form an extension of the present plant and is designed to produce an additional 10,000 tons of blast furnace sinter per week. Also to be extended is the raw materials feed system. Other additions include a coke crushing plant, continuous type sintering machine with all auxiliary equipment, rotary sinter cooler, and finished sinter handling equipment.

AUSTRIA—A new open-pit graphite mine which opened at the beginning of this year was producing 5,000 tons by August. Located at Zettlitz in the province of Lower Austria, its reserves are estimated at 800,000 to 1,000,000 tons. The mineral averages about 50 percent carbon; the graphite itself is a crystalline type. In 1959, Austria expects to have produced over 50,000 tons of graphite, thus becoming one of the world's leading producers.

ITALY—**Mazzacurati & Giacomelli** of Rome, Italy report they have located a 5,000,000-ton deposit of molybdenum-bearing ore in Sardinia, between the towns of Ala Dei Sardi and Buddoso. The percentage of molybdenum in the rock is estimated at 0.6 percent. The firm has a permit to explore for copper, iron, molybdenum, wolframite, and pyrite ores. It has applied to the Sardinian Region for a grant to build two dams on the Pannunzu River in order to contain enough water for operation of a pilot plant and concentrator.

ITALY—During the first half of 1959, Italian production of bauxite increased 18.1 percent, from 117,305 tons in the first half of 1958 to 138,568 tons in 1959. Aluminum output increased 22.1 percent from 28,696 tons to 35,048 tons.

SWEDEN—In the **Renstrom** mine of **Boliden Mining Company** in the Skellefteå district, shaft sinking is underway from the 450 meter level to the 800-meter level. Ore prospecting is done from this shaft. At the **Ostra Hogkulla** mine in the same district, oeprations were shut down this year.

NORWAY—A rich ore lode containing up to 17 percent copper has been found in the **Bursi** mine of **A/S Sulitjelma Gruber.** This is the highest percentage found in Sulitjelma where, until now, they have been working with 1.5 to 2.5 percent copper.

EIRE—Diamond drilling and drifting in ore at depth in the **Mountain** mine of **Emerald Isle Mining Company** in County Cork is rapidly proving a sizable tonnage of good grade copper ore. Early expectations are being confirmed that there is considerable recoverable ore above the 1,350-foot level, grading from 2 percent to 3 percent copper. The initial phase of underground diamond drilling is also proving that the ore-bearing veins will extend to depth much beyond the present workings. Three separate ore bodies are known thus far. The first is the North-South ore body where the firm is drifting on the 1,200-foot level. The second is the New East-West ore body, also being explored on the 1200 level. When the North drift on the 1200 level reaches the intersection of the North-South and New East-West ore bodies, the latter will be opened up by a drift to the west. The third known ore body is the East-West. This is being opened up from the 1,350-foot level. The drift was driven west from the Man-Engine shaft for 50 feet to the Old Skip shaft, and then driven east. **Can-Erin Mines Ltd.** is the parent company.

DENMARK—The 21st session of the **International Geological Congress** will be held in "Norden" in 1960. The sessional meetings will be held in Copenhagen from August 15 to 25. Headquarters will be the Mineralogical-Geological Museum of the University of Copenhagen. Some 3,000 persons are expected to attend. During the session, the **International Paleontological Union** will meet; also the **Association of Sedimentary Petrologists**, the **International Association of Hydrogeologists**, and the **International Mineralogical Association**. There will also be geological excursion before and after the congress, with sightseeing trips around Copenhagen during the congress.

NORWAY—**Mosjoen Aluminium A/S** has started erecting 16 additional furnaces at its new plant in northern Norway. Sixteen others had been installed earlier this year. The latest group will increase production from 25,000 to 32,000 tons a year. Mosjoen is a joint venture of **Electrokemisk A/S** and **Aluminium Industrie AG.** Elektrokemisk has recently joined **Strategic Materials Corporation** of New York and **Koppers Company Inc.** of Pittsburgh, Pennsylvania in plans for commercializing the Strategic-Udy processes for smelting and refining iron ore and other minerals. Electrokemisk will design and supply electric furnaces for plants using the processes; Koppers will design and build the integrated plants.

SWEDEN—Machines are being installed in the new concentration plant of **Malmberget Mines** in Arctic Sweden. Production is scheduled to start early next year. At the **Strassa** mines of **Trafik ab Grangesberk Oxelosund**, the new beneficiation plant is going through trial runs for a few months.

HUNGARY—A multi-million ton bauxite discovery has been made in the Myirad Basin of western Hungary, according to reports. The bauxite is said to be located at a depth of 230 feet.

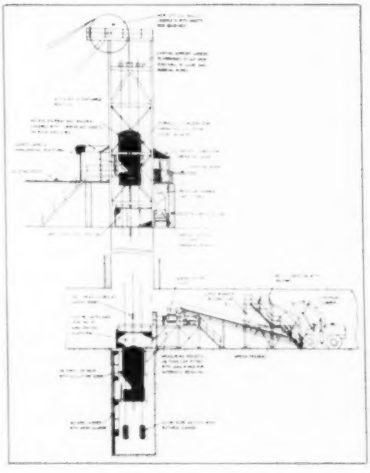
NORWAY—Recent investigation of the extensive nepheline syenite deposits in the Alta district of northern Norway have shown that they are worth developing. **Christiania Spigerverk** reportedly hopes to undertake such development soon. Russia and Canada are the only countries producing nepheline syenite at present.

New Plant To Increase Salt Output

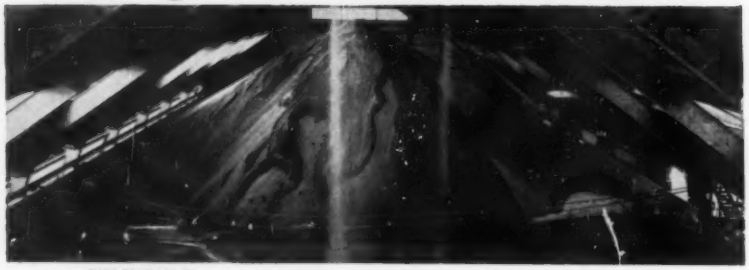
Great Britain's only working salt mine at Winsford is being modernized through the installation of new skip loading and hoisting facilities supplied by Head Wrightson Forge, Ltd., a subsidiary of Head Wrightson & Co., Ltd. The order was placed by I.S.I. Salt Division which sells the output locally.

The rock salt is mined at a depth of 500 feet. The bed is about 80 feet thick, of which a 20-foot thickness is mined by room and pillar methods.

The skip plant arrangement can be seen in the accompanying drawing. To overcome design difficulties, the skips are being constructed entirely of aluminum alloy and will have a payload of 2.3 tons. The skips will be bottom discharge type operated externally by hydraulic rams and fitted with a hinged deck to accommodate men when necessary. An unusual feature incorporated on the measuring pockets is the use of electronic load rings for accurate weight assessment. The whole plant will be electro-hydraulically controlled.

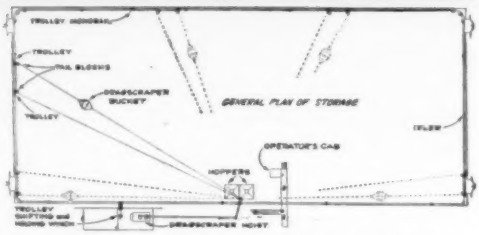


Three Sauerman Methods for Cutting Storage and Reclamation Costs



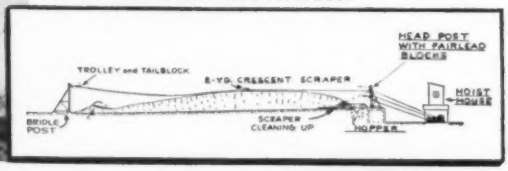
INDOOR RECLAMATION

DragScraper with Trolley and Monorail—Material dropped onto stockpiles from an overhead conveyor is reclaimed to hoppers by a 2½-cu. yd. DragScraper. The installation uses a monorail and trolley system to permit shifting of the scraper bucket by remote control from operator's station at right.—*Sauerman News No. 143.*



OPEN STORAGE

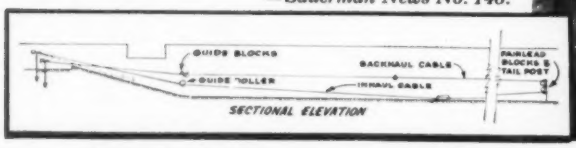
DragScraper with Trolley and Elevated Bridle—DragScraper is reclaiming raw potash to hopper from storage pile. Material is dumped at rear of the pile and moved closer to hopper during intervals when mill requirements are satisfied. Trolley and tail block travel on an elevated bridle between two stiff-leg bridle posts. Shifting of the trolley is provided by a third drum on the Sauerman DragScraper Hoist—*Sauerman News No. 146.*



HANDLING HOT MATERIAL

DragScraper—Hot scale is dropped from ingot buggy track into tunnel and is conveyed by DragScraper to a water sluiceway for disposal. Safety is important here—personnel and vulnerable equipment do not enter the hazardous area.

—*Sauerman News No. 146.*



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ITALY—The **Electrometallurgical Center** of the **Italian Metallurgical Association** is making plans for a Symposium on the Electrolysis of Molten Salts and the Production of Special Non-Ferrous Metals by Electrothermic Method, to be held in Milan next spring. Research trips are also planned in connection with the event. For further information, contact the Secretary's office of AIM, Via Moscova 16, Milan. Reports should be sent before December 31, 1959.

INDIA—The government steel plant at Bhilai, established with the aid of the Soviet government, went into full production on October 12, 1959. Its capacity is 250 tons of steel per day.

MALAYA—Two neighboring companies which have worked closely together in the past are considering a possible merger. **Gopeng Consolidated Ltd** and **Kinta Tin Mines** are studying the plan. Terms recommended by the respective boards would offer Kinta shareholders nine Gopeng units of 3 s 6 d for every five shares of 2 s in Kinta. Last January the two firms entered into a joint agreement to purchase the adjacent **French Tekkah** property. This arrangement gave the firms the benefits of valuable water and electric power supplies, some advantages of assessment under the International Tin Agreement, and also land for dumping purposes.

INDIA—The **Tata Iron & Steel Company** has submitted proposals to the Union government for approval to establish several new plants. One is an alloy and tool steel plant of 100,000 tons capacity, which would be in addition to the existing one in State sector. The firm feels a much larger plant is needed to meet the requirements of India's Third Five-Year Plan which is to be started soon. A second ferro-alloy and ferro-chrome plant would be set up at Joda where Tata has a ferro-manganese plant in operation.

JAPAN—**Showa Denko Company** reportedly will import 3,500 tons of chrome ore from Russia. Earlier this year, the firm had purchased 1,500 tons of Russian chrome. Apparently plant tests proved the ore to be satisfactory.

CEYLON—An ilmenite pilot plant is being erected at Pulmoddai, 40 miles north of Trincomalee on the east coast of Ceylon. A full-scale plant is to be started in July 1960. The complete project will cost the government about £8,000,000 rupees. Two Japanese experts are supervising the project. Expected output is to be 60,000 tons of ilmenite per year. Mining of the mineral beach sand is proceeding at a rate of about 50 tons per day.

MALAYA—**Kent (F.M.S.) Tin Dredging Ltd.** has been carrying out an extensive boring program to determine re-

maining tin reserves. Certain sections have confirmed existence of potentially valuable tin-bearing ground, but it has also been discovered that there is a high proportion of stiff clay in this ground, extending in varying depths, and this presents a serious problem. An extensive research program has now been devised in order to find a method for improving the economic recovery if and when mining operations are resumed. The latter depends upon tin control regulations which now prevent the company from operating on a profitable basis.

INDIA—Exploratory drilling for uranium has started in the Suryamali Hills and adjoining area of Salem district, Madras state.

PAKISTAN—The **Geological Survey Department** is being expanded to step up the pace of mineral exploration. Fourteen more geologists are being added to the department. The government has also set aside Rupees 26,000,000 worth of foreign exchange for mineowners so they can import modern mining equipment and machinery. This is part of an effort by the government to encourage mineral exploration on scientific lines. Mining rules are being revised to ensure more systematic undertakings. One proposed amendment provides for one-year prospecting leases, with mining lease given only if results of prospecting conform to certain required standards.

BURMA—The market for wolframite concentrates has been slightly improved this year, and this has helped the Tavoy and Mergui districts in their exports of this concentrate. For the first six months of 1959, the Mergui district's wolframite exports increased greatly—from 41.6 tons in the first half of 1957, and 13 tons in the first half of 1958, to 74 tons in the first half of 1959. This was due to the clearing up of all stocks on hand when the government's **Yadanabone** mine was closed down. During the same period, 72.45 tons of tin concentrates were exported in (first half) 1957, 153 tons 1958, and 225 in 1959. The Tavoy district exported 327 tons of wolframite concentrates in the first six months of this year, compared with 414.75 tons in the same period of 1958, and 306.4 in 1957. Tin concentrates exports in the first six months of 1959 totaled 440 tons, compared with 628.75 in 1957 and 306.40 in first half of 1957.

PAKISTAN—Large deposits of beryl ore containing 12 percent beryllium oxide have been reported by a Pakistani-German business firm in the Hazara district. The group had been making a survey of the area.

INDIA—The **Geological Survey of India** estimates that total copper ore reserves proved so far amount to about 3,370,000 tons. Output in 1958 was about 250,000 tons of ore. Domestic requirements are estimated at about 50,000 tons of copper metal annually. The **Indian Copper Corporation Ltd.** at Ghatsila produces only 8,000 tons—the balance being imported. Attention is now being concentrated at the **Khetri** mines in Rajasthan where copper content varies from 0.75 percent to 2.5 percent. These copper-pyrite deposits are estimated to total around 25,000,000 tons. Simultaneously, a search for copper ore has been instituted all along the foothills of the Himalayas—in Jammu and Kashmir, the Punjab, Bihar, and Assam. A team of experts from Poland is expected to visit India shortly to finalize terms for supply of machinery and plants.

SOUTH KOREA—The **Mining Bureau** of the **Ministry of Commerce & Industry** says it has confirmed the presence of a 3,000,000-ton deposit of magnetite at the **Yangyang** iron mine. The Bureau test drilled the area in conjunction with an application for a $1,000,000 DLF loan for mine development. The 3,000,000-ton figure is 2,000,000 tons less than the anticipated quantity. The **Samhwa** iron mine will be drilled next.

HAITI—**Denver Equipment Company** has ordered three classifiers from **Head Wrightson & Co. Ltd,** for installation in the **Sedren S.A.** operations at Haiti. The equipment is to handle 500 short tons of copper ore per day. Good progress is reported at the property and production is expected to start by next spring. Foundations have been poured for many

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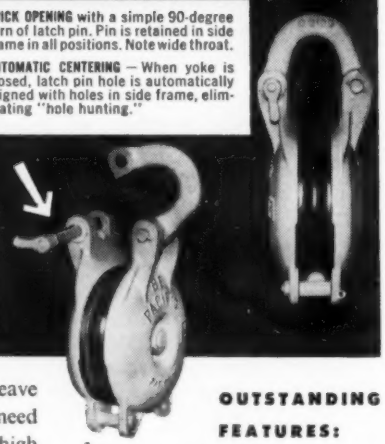

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of the buildings, including crusher, concentrator, and ore storage facilities. Underground lateral work is underway on the 1,500-, 1,330-, and 1,150-foot adits. On the 1,500-foot level, crosscuts reportedly exposed 50 feet of ore averaging 4.23 percent copper. Diamond drilling on this level also has established additional ore to the west. The company is a subsidiary of **Consolidated Halliwell, Ltd.**

MEXICO—The **Mexican Mineral Development Commission** has built a 7,500-ton flotation mill in the famous old silver mining center of Pachuca, state of Hidalgo, to reprocess waste ores which have accumulated over the past 50 years. The plant will postpone for a while the imminent shutdown of all precious metals operations in the district because of exhaustion of the deposits. Some 50,000,000 tons of waste are to be processed over a 14-year period. Recovery rate is to be 1 percent lead, 1 percent zinc, 2 percent iron, and 45 grams silver, per ton.

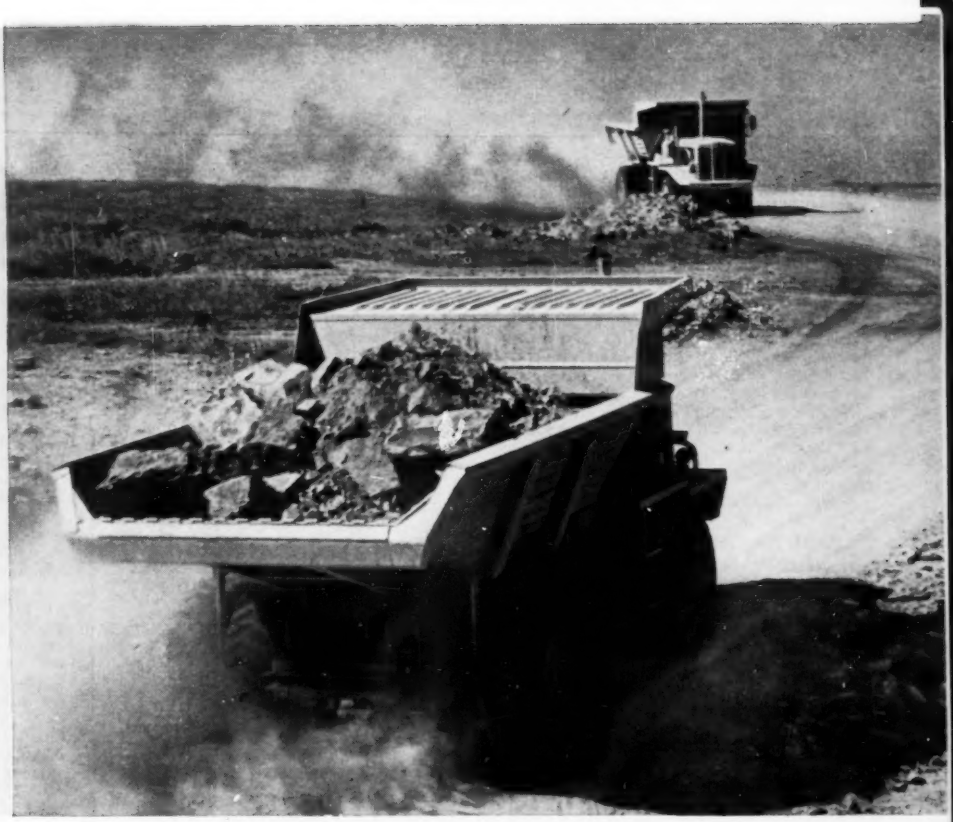
HAITI—**Reynolds Metals Company** is to deliver to the U.S. stockpile 400,000 tons of bauxite from Haiti in the next year. This $6,000,000 to $6,500,000 transaction is a barter arrangement. The bauxite will be exchanged for U.S. surplus high protein wheat which will be sent to **Caribbean Mills** in Haiti. This will be the first U.S. government barter contract involving exchange of Haitian ore for U.S. farm products. It will enable **Reynolds Haitian Mines Inc.**, a subsidiary, to increase its operations to full capacity next year.

PERU—Three copper properties on the coast south of Lima are to be developed by a new U.S. group composed of Hal Millsap, Jr., president of **Millsap Oil & Gas Company** of Siloam, Arkansas, and Victor Oppernheim, mining and oil consultant of Dallas, Texas. Reportedly the group has optioned and surveyed the properties. Included is the **Deluvio** mine, which had been held previously by the **Rosenshine** interests. It is located at Quebrada de Otoco, near Nazca. The other properties are located near Ica and Mala.

CUBA—The Fidel Castro government has made a number of moves affecting U.S.-held mineral lands in the last few weeks. (These may already be outmoded by MINING WORLD press time.) A five percent tax has been levied on mineral production, plus 25 percent on ores and minerals exported. A fee of $20 per hectare may also be charged annually on ore bodies not being adequately developed and $10 per hectare annually on ore bodies in production. In another action, owners of mining claims are given 120 days in which to re-register their holdings, paying a fee of $100 per claim. Work must then be started on these claims within 60 days or lose all rights on the claims. In Orient Province nearly 75,000 acres of foreign-controlled have been seized by the government in an agrarian reform move. Land seized included nearly 10,000 acres held by **Bethlehem Steel Corporation**, 30,000 acres of mineral concessions held by **Cuban Development Company**, a U.S. exploration firm, and 35,000 acres controlled by **Compania Phillips**, a subsidiary of **Phillips Petroleum Company**.

BOLIVIA—**South American Placers, Inc.**, wholly owned subsidiary of **South**

Walker Cut Stone Co., Milford, Kansas, replaced *six* smaller overworked gasoline haulers with only two 19-ton Model 65 Payhauler trucks! Their "65's" deliver 150 tons of limestone per hour, from quarry to crusher.



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Even against competitive haulers of similar rated capacity, the new 65 Payhauler gives you overwhelming advantages!

Of all off-road haulers in its size class, only the 65 Payhauler has the International-developed rock-ribbed corrugated body! This strength-multiplying principle lets the "65" shed 5,000 lbs. of power-wasting weight, and gain a full ton of payload capacity.

Prove the power-to-payload advantages the new rock-ribbed 65 Payhauler delivers! Compare the "65's" cycle-speeding combination of air-assist shifting; 11-second dumping, fast reversing; super-power braking; bonus-leverage, vibration-free power steering! And for 27-ton capacity, note how the 375-hp "95" leads the field. See your International Construction Equipment Distributor for a demonstration!

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American Gold & Platinum Company, has started dredging operations with its new 10-cubic-foot dredge purchased in New Guinea in April 1958. The dredge was dismantled, and transported by truck to Lae, New Guinea; shipped to Arica, Chile; railed to La Paz, Bolivia; and moved by truck as far as the highway went. Then the firm built a strip at that point, bought two Northrup tri-motor planes, and flew the dredge the last stretch to the property. To date, the firm has flown in over 3,200 tons of dredge and camp construction equipment. The operations are in the Kaka-Beni area, east of the Andes in the upper Amazon region.

PERU—An advance payment of $4,000,000 has been made by **Ore Marketing Corporation S.A.** of Panama to **Panamerican Commodities S.A.**, owners of the **Acari** iron mine south of Lima. Under terms of the agreement, **Acari Iron Mining Company** will use the money to complete development of the property and as working capital. In turn, Acari will ship a minimum of 450,000 tons of iron ore annually to Ore Marketing. The corporation also operates the **Santa Barbara** iron mine in Chile.

CHILE—In addition to its **Andacollo** mine in the Putaende Region, which was recently brought into production, the **Andacollo Mining Company Ltd.** has also acquired the **San Juan** which has now started making shipments to the Llayllay mill. The final product from both mines is a 30 to 35 percent copper concentrate.

MEXICO—**Compania Exploradora del Istmo S.A.**, wholly owned subsidiary of **Texas Gulf Sulphur Company**, has been producing sulphur since 1957, but has made no shipments yet. The firm's property is at Nopalapa Dome on the Isthmus of Tehuantepec.

PERU—During the past eight years, **Cerro de Pasco Corporation** has examined 546 prospects at a cost of $342,000, and 20 exploration projects were carried out costing about $3,000,000. Among the failures were **Oyon** ($67,719), **Vilcabamba** ($14,077), **Colquipucro** ($21,527) and **Huallanca-Huanuco** ($190,165). Exploration at **Tintaya** (Espinar province) cost $118,875 and results are not definite. About 2,000,000 tons of low-grade copper ore are estimated in reserve. The property will be held in relation to the nearby **Ferrobamba** project. **Antamina** exploration (Huari Province) cost about $1,052,-260. To date, reserves of copper are estimated at between 50,000,000 and 100,000,000 tons. Exploration and development are continuing.

CHILE—**Compania Minera Santa Fe** and its Canadian partner, owners of the **El Dorado** iron mine (12,000,000 tons), **El Pleito** iron mine (8,000,000 tons), and **El Carmen** iron mine (6,000,000 tons), expect to produce over 2,000,000 tons this year. Most of this goes to the United States and Germany. Modern mining machinery from England has been installed recently to increase output.

VENEZUELA – Diamond production in Venezuela dropped in 1958 because of a very long rainy season in Bolivar State and in the Amazonas Federal Territory, where the diamonds are washed from the river sands. Output totaled 89,565 carats, compared with 122,598 carats in 1957. Venezuelan production over the past 10 years amounted to a yearly average of 87,559 carats. Total was 907,475 carats.

PERU – Large outcrops of chromite have been found in Tapo, north of Ayacucho, near the bend of the Mantaro River called Peninsula de Tayacaja. In Peru, the pre-Cambrian terrains are known to be present only along a narrow band mainly in southwestern Cuzco Department. This area is almost ignored because of the great altitudes to cross and lack of roads. The assays of composite samples have shown that the chromite from Tapo is of the aluminous type suited for the refractories industry. Evaluation of the deposit has not been completed.

VENEZUELA—Manuel Pernas Lopez reports that he has located silver and gold-bearing galena in the **Santa Ines** deposit located in the Municipality of Camp Elias, Bruzual del Edo District, Yaracuy state. Geologists of the Ministry of Mines have taken samples.

CHILE—**Marvis Corporation**, a United States firm, is reported to be spending $5,000,000 through **Compania Minera Mantos Blancos**, five kilometers north of Antofagasta. This mine contains copper ore averaging 1.6 percent.

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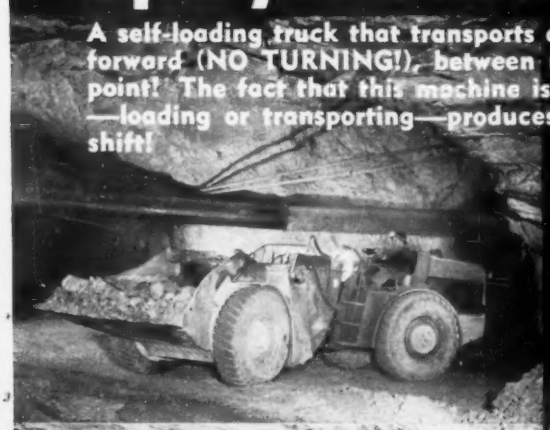

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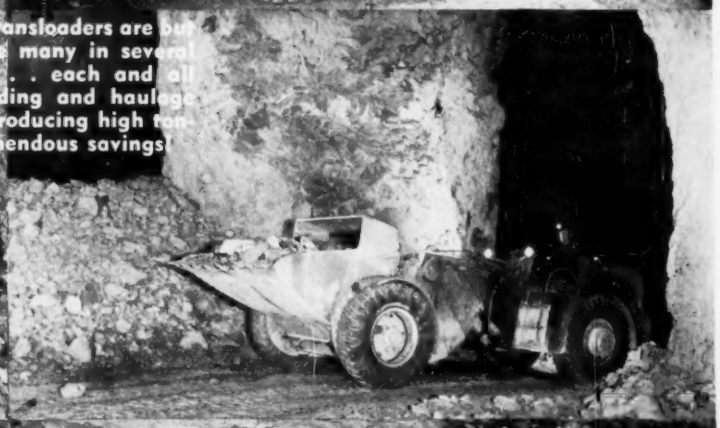

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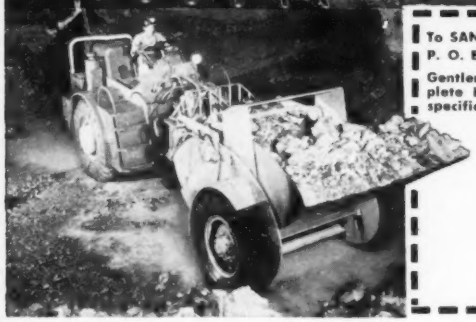

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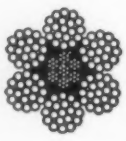

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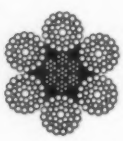

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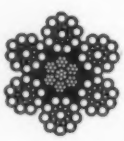

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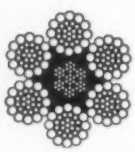

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Lake Asbestos of Quebec Ltd. ..... May 87
Lake View and Star Ltd. ... May 84
Lamaque Gold Mines .... May 88
Laporte Ltd. ..... Jan 78
Sociedad Latorre Prenafeta Sept 114
Leitch Gold Mines ..... Apr 58
Lepanto Consolidated Mining Co. .... Apr 57, May 7, July 88
Liberia Mining Co. Jan 70, July 86
Liberian-American-Swedish Minerals Co. (LAMCO) July 85
Liberty Chromite Mining Corp. ..... May 84
Cia. Minera Lillas ..... Sept 121
Lindsay Explorations ..... Oct 75
Little Long Lac Gold Mines Ltd. ..... May 88
Negociacion Mineral y Metalurgica Lizandro Proano S. A. ..... Sept 117
Lokken Verk ..... Sept 105
Loloma (Fiji) Gold Mines N. L. ..... June 89
Loraine Gold Mines Ltd. .. Nov 90
Lowland Lead Mines Co. .. Jan 78
Lowphos Ores Inc. ..... Mar 88
Lun-Echo Gold Mines .... Feb 76
Luossavaara-Kiirunavaara Aktiebolag (LKAB) Mar 82, May 79, 86, 87
Lurgi-Chemie ..... Feb 76
Lurgie Gesellschaft ..... Oct 75*

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M. T. D. (Sanyati) Ltd. .. July 86
Mac Phail Engineering Co. Jan 73, Mar 90

*Photograph

Foreign Companies (News)

Machinoimport .....May 85
Magnesium Co. Ltd. .....Nov 78
Magnet Cove Barium Corp. July 82
Majdanpek copper mine ...Apr 52
Malayan Tin Dredging Ltd. Mar 83, Oct 74
Malmberget Mines .....Dec 63
M. T. D. Mangula Ltd. Mar 83, May 79
Manila Mining Corp. ...Jan 76, Oct 78, Nov 86
Manitou Consolidated Mines Ltd. .....Jan 73
Mannesman Roehrenwerke July 82, Sept 112
Compania Minera Mantos Blancos .....Dec 68
Mapanzui Chrome Mines Pty. Ltd. .....Mar 86
Marban Gold Mines Ltd. (formerly: Consolidated Marbenor & Malartic Goldfields, Ltd. .Feb 77, Nov 79
Marble Lime and Associated Industries Ltd. Jan 72, Mar 86
Marchant Mining Co. ....Nov 79
Marinduque Iron Mines Inc. Jan 76, Sept 119, Dec 61
Marlime Chrysotile Asbestos Corp. .....Mar 86
Marubeni Iida, Ltd. .....May 84
Mary Kathleen Uranium Ltd. .....Jan 76, June 89
Matsuo Mining Co. .....Mar 83
Mattagami Lake Mines ...Apr 58
Mavis Bank Mining Co. ..Mar 88
Mazzacurati & Giacomelli ..Dec 63
Minera Mediana .....Sept 115
Meiji Mining Co., Ltd. ....Nov 85
Sociedade Mineira do Melela .....Jan 70
Merriespruit (Orange Free State) Gold Mining Co., Ltd. .....Mar 84
Merrill Island Mining Corp. June 92
Messina Rhodesia Smelting and Refining Co., Ltd. .....May 79
Messina (Transvaal) Development Co., Ltd. May 79, July 86
Metal Corp. of India Ltd. June 88, Sept 104
Metal Recoveries Pty. Ltd. Nov 75
Metallgesellschaft Aktiengesellschaft .....June 91
Cia. Metallurgica ASARCO .....Mar 87
Mid-West Copper & Uranium Mines, Ltd. ... Sept 114
Middle Witwatersrand (Western Areas) Ltd. ..Sept 121
Midwest Diamond Drilling Co. Ltd. .....Apr 58
Millsap Oil & Gas Co. ....Dec 66
Minera Milpo .....Jan 69
Mineral Development Corp. Feb 79
Minerales y Metales Industriales, S. A. .....Jan 80
Minerales y Productos Ceramicos .....Nov 88
Minerales Pennsalt, S. A. Jan 80, July 82
Minerals Separation Ltd. ..Aug 78
Mine Development Ltd. ..Sept 112
Mitsubishi Metal Mining Co. Ltd. ..Jan 69, 79, Feb 79, Aug 79, Oct 67, Nov 84
Mitsubishi Shoji Kaisha Ltd. .....May 84, June 87
Mitsui Mining Co. Feb 73, June 87
Moa Bay Mining Co. ..Jan 63, 79
Sociedade Mineira de Mocubela .....Jan 69
Sociedade Mineira de Mocumine .....Jan 69
Mogul Mining Corp. .....Aug 80
Mokata El Hadid Mar 79, Sept 104
Monazite and Mineral Ventures Co. .....May 81
Mond Nickel Exploration, Ltd. .....Aug 78
Moneta-Porcupine Mines, Ltd. .....Mar 90, Sept 98
Monteminas, Ltd. .....Sept 121
Sociedade Mineira do Monteminas .....Jan 70
Montgary Explorations, Ltd. June 91
Jose Ermirio de Moraes ...Apr 56
Morimura Brothers .....Nov 85
Morning Star Gold Mines, N. L. .....June 89
Morrison-Knudsen Co., Inc. Feb 73
Sociedade Mineira de Morropino .....Jan 69
Mosjoen Aluminum A/S May 85, Dec 63
Mount Harris Tin Mines N. L. .....Jan 76, July 88
Mount Isa Mines Ltd. ....Jan 73, Mar 81, Aug 79, Sept 45, Oct 77, Dec 61
Mount Lyell Mining & Railway Co. Ltd. ..Jan 73*, Mar 80
Mufulira Copper Mines, Ltd. Feb 78, Oct 78, Dec 60
Muller, W. H., and Co. ..Nov 88
Murray Mining Corp. ....Aug 83
Cie. Miniere du M'Zaita ..Aug 76

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Minerales de Nacozari ....Nov 86
Naraguta Extended Areas Ltd. .....Oct 79
Naraguta Karama Areas Ltd. .....Jan 70
National Coal Board ....May 79*
National Malartic Gold Mines Ltd. .....Apr 58
National Mineral Development Corp. .....Jan 81
National Rice and Corn Corp. .....Feb 80
Nchanga Consolidated Copper Mines Ltd. ... Jan 69*, Apr 54, June 85, Aug 78, Oct 78
New Broken Hill Consolidated N. L. .....Mar 80
New Consolidated Goldfields, Ltd. of So. Africa Jan 72, May 82, Dec 60
New Consolidated Prospecting Co. .....May 82
New Hosco Mines Ltd. Mar 88, Aug 82
New Manitoba Mining and Smelting Co. .....Dec 59
New Merloo Gold Mines N. L. .....May 84
New Wellington Mines Ltd. (formerly: Wellington Mines, Ltd.) .....Feb 76
New Witwatersrand Gold Exploration Co. Ltd. .....Jan 69
New York-Alaska Gold Dredging Corp. Jan 73, Mar 90, May 7
New Zealand Development Corp. .....Jan 77, Sept 120
Newfou dland-Labrador Exploration Syndicate .....Feb 76
Newmont Exploration, Ltd. Nov 67
Newmont Mining Corp. ....Feb 77
Societe Le Nickel .....Dec 62
Nickel Mines of Australia Pty. Ltd. .....Apr 56
Nickel Mining & Smelting Corp. (formerly: Eastern Mining & Metals Co.) Jan 80, June 92, Nov 79
Nimpkish Iron Mines Ltd. May 87, Aug 82
Nippon Electrolytic Metallurgical Co. .....Sept 108
Nippon Mining Co. Jan 69, 80, Feb 73, Apr 57, May 88, June 87, Sept 106
Cia. Niquel Tocantins .....Apr 56
Nitton Metal Mining Co. Jan 81, Apr 55, Oct 73
Nomura Mining Co. ....Sept 114
Noranda-McIntyre-Canadian Exploration .....Apr 58
Noranda Mines Ltd. Mar 90, Apr 58, May 88, July 82, 90, Sept 114, Oct 75
Corporacion Nord-Patagonia Jan 81
Nordstroms Linbanor .....July 85
Norseman Gold Mines N. L. Apr 57
Norsk Jernverk .....Aug 81
North American Rare Metals May 87
North American Utilities of Canada .....Nov 7
North Australian Uranium Corp., N. L. .....May 84
North Coldstream Mines (formerly: Coldstream Copper Mines Ltd.) ... June 92, Oct 76
North Rankin Nickel Mines Ltd. .....Mar 88, Aug 83
North Shore Gold Fields & Mines Ltd. .....May 83*
Northern Aluminum Co. Ltd. .....June 89
Northern Mining Co. ....Feb 76
Northern Peru Mining & Smelting Co. ....Jan 69, Feb 73
Northshire Goldfield Mines ..May 7
Northspan Uranium Mines Mar 88, Aug 82
Northwestern Exploration Ltd. .....Mar 90
Nortje & Gueche .....Sept 7
Norway Lake Iron Mines ..Jan 73
Nullamanna Sapphires Pty. Ltd. .....Dec 62
Societe Miniere de Nyamukuki (Somikubi) .....Dec 19

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Huetterwerk Oberhauser ..Sept 112
Offin River Estates Ltd. ...Mar 86
Oglebay Norton Co. Feb 76, May 87, July 90
Cie. Miniere de L'Ogooue (Comilog) ...Mar 79, Sept 104
Oklend Gold Mines Ltd. ..May 88
L'Omnium Nord Africain ..Nov 71
O'okiep Copper Co. .....June 86
Ore Marketing Corp. S. A. Dec 68
Ornopia, G. Y., and Associated Inc. ....Nov 85, Dec 62
Cie. Miniere de l'Oubanghi Oriental ....Mar 79, Sept 104
Outokumpu Mining Co. Apr 52, May 83, May 87, Oct 8

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Pacific Nickel Mines .....Aug 81
Pacific Quarries Ltd. .....Jan 61
Pacific Tin Consolidated Corp. .....Jan 69, Apr 56
Pacific Water Wells Ltd. ..Aug 83
Pacific Western Metals Co. Nov 80
Syndicato Minero Pacococha, S. A. .....Sept 117
Pagadian Iron Mines Co. ...Nov 81
Pakistan Industrial Development Corp. .....Oct 75
Palawan Consolidated Mining Co. .....Feb 80
Palawan Quicksilver Mines Feb 80, Sept 119
Cia. Minera Palca S. A. ...Mar 86
Panamerican Commodities S. A. .....Dec 68, Jan 80
Panther International Mining Co. .....Feb 76
Pardee Amalgamated Mines Ltd. .....May 87
Paterson Zochonis & Co. ..May 81
Pater Uranium Mines Ltd. Dec 59
Patino Mines & Enterprises Consolidated, Inc. June 90, Oct 73
Pato Consolidated Gold Dredging, Ltd. .....May 83
Pechiney Jan 77, Mar 81, 86, Apr 42
Peerless Oil Gas, Inc. Mar 90, July 90, Sept 114
Peko Mines N. L. ...Jan 76, June 89, Sept 119, Oct 77, Dec 61
Pendragon Corp. Ltd. .....Aug 83
Penelope Explorations Ltd. Aug 83
Societe Miniere et Metallurgique de Penarroya ....Sept 106
Cia Minera de Penoles S. A. Mar 87, June 90
Perron Gold Mines Ltd. ...May 88
P. T. Perusahaan Belirang Telaga Bodas .....May 84
Phelps Dodge Corp. of Canada .....Mar 90
Philex Mining Corp. .....Mar 80, Apr 57, Oct 77, Nov 85, Dec 61
Philipp Bros. Inc. .....Apr 55
Philippine Iron Mines July 88, Oct 77
Compania Phillips .....Dec 66
Phoenix Copper Co. Ltd. Jan 73, Apr 58
Phosphate Development Corp. (FOSKOR) .....July 86
Pickands Mather & Co. Feb 76, Mar 88
Pickle Crow Gold Mines ..May 88
Pioneer Gold Mines Ltd. ...Feb 76
Pioneer Mining Corp. .....May 84
Pitch-Ore Uranium Mines Ltd. .....May 88
Placer Development Ltd. ..Jan 76
Portage Island (Chibougamau) Mines .....May 88
Potash Co. of America Jan 73, Nov 80
Premium Iron Ores Ltd. ...Nov 79
President Brand Gold Mining Co. .....Jan 71, Apr 54
Negociacion Minera y Metalurgica Proano S. A. ....Mar 86
Pronto Uranium Mines Ltd. July 90, Dec 59
Prospectors Airways .....Apr 58
Cia. Minera Punataqui ....Aug 73

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Quebec Cartier Mining Co. Mar 90, Apr 52, Oct 7, Dec 59
Quebec Lithium Corp. ....Oct 62
Queensland Mines Ltd. ....July 87
Sociedad Minera de Quetana Feb 73

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Rana Gruver A/S .....Jan 77
Ranshofern Aluminum Works Aug 81
Ranworth Explorations ....Apr 58
Rash-Mac Exploration ....Mar 90
Ravensthorpe Copper Mines N. L. .....Apr 57, Nov 84
Realty Mining Syndicate N. L. .....Jan 77
Reeves MacDonald Mines, Ltd. .....June 92
Reynolds Haitian Mines, Inc. Dec 66
Reynolds Jamaica Mines, Ltd. .....Nov 78
Rhodesia-Katanga Co., Ltd. June 85
Rhodesian Selection Trust Ltd. .....Mar 84, Apr 52, July 7, 78, Sept 120, Oct 7, 78
Rhodesian Selection Trust Exploration Ltd. .....July 86
Rhokana Corp. Ltd. .....Mar 84, May 80, Oct 79, Nov 90
Ribon Valley (Nigeria) Tinfields .....June 85, Nov 90
Riddarhytte A. B. .....Apr 52
Riebeeck Gold Mining Co. Ltd. .....Nov 90
Minero Rio Pallanga .....Jan 69
Rio Tinto Australia Pty. Ltd. Jan 73*, 76, Oct 77
Rio Tinto Canadian Exploration Ltd. .....Oct 75
Rio Tinto Co., Ltd. Sept 104, Dec 63
Rio Tinto Dow, Ltd. Nov 31, Dec 63
Rio Tinto Mining Co. of Canada, Ltd. .....Jan 76, Mar 90, May 7, July 90, Nov 31
Rio Tinto (N. R.) Ltd. ...June 85
Rio Tinto (S. R.) Ltd. July 86, Oct 7
Rix-Athabasca Uranium Mines Ltd. .....May 87
Roan Antelope Copper Mines, Ltd. .....Oct 78
Roberval Mining Co. May 87, July 90
Rompin Mining Co. .....Jan 80
Rosenthal Porzellan A. G. ..Apr 55
Rourkela Steel plant .....May 83
Ruskealan Marmori Oy ....Feb 75
Rustenberg Platinum Mines Ltd. .....Oct 79
Ruth Gold Mines Ltd. ....Nov 79

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S. A. M. Explorations ....Sept 114
St. Helena Gold Mines Ltd. June 85, Oct 79
St. Lawrence River Mines Jan 73, Nov 7
St. Patrick's Copper Mines, Ltd. .....Aug 80
St. Stephen Nickel Mines ..Oct 76
Cia. Salinera Punta del Lobos S. A. .....Sept 114
Salmita Consolidated Mines Ltd. .....Aug 83
Samar Mining Co. Jan 76, Mar 80, Aug 80
San Antonio Gold Mines ..July 89
San Francisco Mines of Mexico Ltd. .....Mar 87, July 82
Cia. Minera San Felipe ....Feb 75
Sannae Nickel Mining Co. Sept 110
Cia. Minera Santa Barbara Mar 86, Oct 73
Cia. Minera Santa Fe June 90, Aug 76, Oct 73, Dec 68
Cia. Minerales Santander, Inc. .....May 83
Santa Rose Mining & Agricultural Co. .....Mar 88
Sarakreek Goudvelden N. V. .....May 83*
Sedren S. A. .....May 83, Dec 66
Selco Explorations .....Apr 58
Selection Trust, Ltd. .....Dec 59
Sematan Bauxite Ltd. .....July 85
Sheep Creek Mines Ltd. Feb 73, May 83
Sherritt Gordon Mines Ltd. Oct 75, Nov 78
Shimura Kako Chemical Processing Co. .....Nov 7
Showa Denko Co. Sept 108, Dec 64
Siamese Tin Syndicate Ltd. Jan 77
Cia. Siderurgica Mannesmann .....Oct 73
Cia. Siderurgica Paulista (COSIPA) .....Mar 86
Cia. Siderurgica de Ponferrada .....Sept 105
Cia. Minera Sierra Gorda ..Mar 88
Sierra Leone Selection Trust Ltd. .....Mar 86
Silver Mountain Mines Ltd Jan 73
Silver Ridge Mining Co. Ltd. Jan 72, Apr 58
Silver Standard Mines ....Mar 90
Silvermines Lead & Zinc Co., Ltd. ...Apr 52, Aug 81, Oct 81
Simon-Carves, Ltd. .....Sept 119
Skanska Cement A. B. .....July 85
Somikubi .....Nov 7
Minas de Soterrada .....Nov 88
South Africa Minerals Corp. Ltd. .....Mar 84, Sept 120

Metal & Mineral Prices

U.S.A.

METALS

November 20, 1959

COPPER: **Electrolytic.** Delivered F.o.b. cars, Valley basis (pound) ..... 33.00¢
Lake. Delivered, destinations, USA ..... 33.00¢
Foreign. Delivered, destinations, USA ..... 33.00¢
Custom ..... Nominal
LEAD: **Common Grade.** New York (Per pound) ..... 13.00¢
Tri-State Concentrate, 80% lead, per ton $156.12
ZINC: **Prime Western:** F.o.b. E. St. Louis (Per Pound) ..... 12.50¢
Prime Western: Delivered New York ..... 13.00¢
Tri-State Concentrate, 60% zinc, per ton ..... 76.00¢
ALUMINUM: **Primary 30 Pound Ingots (99% plus)** (Per pound) 26.80¢
ANTIMONY: **Lone Star Brand. F.o.b. Laredo, in bulk** (Per pound) 29.50¢
BISMUTH: (In ton lots) price per pound $2.25
CADMIUM: **Sticks and bars.** 1 to 5 ton lots Price per pound .. $1.40
COBALT: **97.99%, keg of 550 pounds (Price per pound)** $1.75
COLUMBIUM: **Powder** ..... Nom., per pound $55.00-$85.00
GERMANIUM: dioxide, high purity, gram ..... 18.50¢
LITHIUM: **98%** (per pound) ..... $9.00-$12.00
MAGNESIUM: **Ingots (99.8%)** F.o.b. Velasco, Texas, per pound 36.00¢
MERCURY: **Flasks.** Small lots, New York ..... $218.00-$220.00
NICKEL: **"F" Ingots (5 pounds).** F.o.b. Port Colbourne, Ontario 75.50¢
PLUTONIUM: To July 1. 1962 AEC will pay $30.00 to $40.00 per gram depending on plutonium 240 content. July 1, 1962 to June 30, 1963, per gram $30.00
SELENIUM: **99.5%, per pound** $7.00
TELLURIUM: Common grade, Per pound $2.50
THORIUM: per kilogram $43.00
TIN: **Grade A Brands.** New York (Per Pound) Prompt delivery $101.125
TITANIUM: **93.3%** + Grade A-1 Sponge (Per pound) ... $1.50-$1.60
URANIUM: **Rod** (0.790 U-235) $16.00 Per Pound; Foil $16.75
U-235: **Nominal** (Per pound) $7,725
GOLD: **United States Treasury Price** ..... $35.00 per ounce
SILVER: **Newly mined domestic.** U.S. Treasury price per ounce 90.5¢
Foreign Handy Harman ..... 91¾¢
PLATINUM: Per ounce ..... $77.00-$80.00
ZIRCONIUM: **Sponge,** Per pound, Reactor Grade $5.00

ORES AND CONCENTRATES

BERYLLIUM ORE: **10 to 12% BeO.** F.o.b. mine, Colorado $46.00 per unit Small lot purchases at Custer, S. D., Spruce Pine, N. C.,and Franklin, N. H. Visual inspection at $400.00 per short ton or by assaying at 8.0 to 8.9% BeO, $40 per unit; 9.0 to 9.9%, $45; over 10.0%, $48.00.
CHROME ORE: F.o.b. railroad cars eastern seaports. Dry long tons,
African (Rhodesian). 48% CR_2O_3. 3 to 1 Ratio .... $35.00-$36.00
African (Transvaal). 48% Cr_2O_3. No ratio ..... $28.00-$32.00
Turkish, 48% CR_2O_3. 3 to 1 chrome-iron ratio .. Nominal $45.00
U.S. Government ore-purchase depot Grants Pass Oregon. Buying suspended, quota filled.
COLUMBIUM-TANTALUM ORE: Per Pound Pentoxide Nominal $1.00
IRON ORE: **Lake Superior. Per gross ton Lower Lake Ports**
Mesabi, Non Bessemer, 51.5% Fe $11.45
Mesabi, Bessemer, 51.5% Fe $11.60
Old Range Non Bessemer $11.70
Old Range Bessemer $11.85
Swedish, Atlantic Ports, 60 to 68% Fe Contracts, Per Unit 25.00¢
MANGANESE ORE: **Metallurgical grade. 48 to 50% Mn** Long ton unit ..... $0.95-$1.00
Metallurgical grade. 46 to 48% Mn. Long ton unit ... $0.90-$0.95
Metallurgical grade. 44 to 46% Mn. Long ton unit ... $0.80-$0.85
Domestic U.S. Government, GSA Basis $2.30 per unit for 48% mn.
MOLYBDENITE CONCENTRATE: **90% MoS_2 F.o.b.** Climax, Colorado. Per pound Mo, plus container cost $1.25
TUNGSTEN CONCENTRATE: **Domestic.** 60% WO_3 Per short ton unit ..... Nominal $23.00
Foreign: 65% WO_3 Per short ton unit (Scheelite) ... Nominal $16.00
Foreign: South American, Spanish, Portuguese ..... Nominal $15.00
URANIUM ORE. F.o.b. purchase depot or company mill in accordance with AEC schedules and company buying contracts. Basic price is $1.50 per pound of U_3O_8 in ore assaying 0.10 percent. For each additional 0.01 add 20¢. Subject to development allowance, premiums, penalties where applicable.

NON-METALLIC MINERALS

BARITE: Oil well drilling. Minimum **4.25 specific gravity,** per short ton $16.00
BENTONITE: **Minus-200mesh.** F.o.b. Wyoming. Per ton, carload lots $12.50
Oil Well grade. Packed in 100 pound paper bags $14.00
BORON: technical grade .. F.o.b. Boron California. Per ton $47.50
FLUORSPAR: **Metallurgical grade.** 72.5 % effective CaF_2 content per short ton F.o.b. Illinois-Kentucky mines ... $37.00-$41.00
Mexican. 70% F.o.b. border ..... $26.00-$27.00
Acid Grade. 97% CaF_2, Bulk, F.o.b. mine ..... $45.00-$49.00
PERLITE: **Crude:** F.o.b. mine per short ton ..... $3.00 to $5.00
Plaster grades. Crushed and sized. F.o.b. plants .... $7.00 to $9.00
SULPHUR: Long ton, F.o.b. Hoskins Mound, Texas $25.00
Export ..... $24.00-$25.00

London

November 20, 1959

				Per Long Ton USA Equivalent cents per pound*
COPPER:	**Electrolytic spot**	£254	0s 0d	31.75¢
LEAD:	**Refined, 99%**	£ 71	12s 6d	8.95¢
ZINC:	**Virgin, 98%**	£ 95	2s 6d	11.90¢
ALUMINUM:	**Ingot, 99.5%**	£180	0s 0d	22.50¢
ANTIMONY:	**Regulus, 99.6%**	£197	10s 0d	24.69¢
TIN:	**Standard, 99.75%** ..	£796	0s 0d	99.50¢
TUNGSTEN:	**Long ton unit**	132s		$18.48

***With Sterling Pound at $ 2.80**

Quotations on metals and certain ores through the courtesy of *American Metal Market, New York, N. Y.*

(News) Foreign Companies

South African Iron & Industrial Steel Corp. June 85, Aug 78
South African Manganese Ltd. ..... Sept 120
South Alligator Uranium N. L. Feb 80, May 84, Aug 80
South American Gold & Platinum Co. ..... Mar 87, Nov 86
South American Placers, Inc. Mar 87, May 7, Nov 86, Dec 66
South Crofty, Ltd. ..... Jan 77, Apr 52, July 82, Oct 81
South Pacific Mines, Ltd. Sept 104
Southern Peru Copper Corp. Feb 73, Mar 79, Sept 103
Spartan Air Services ..... July 90
Standard International Mines May 87
Stanleigh Uranium Mining Corp. ..... Feb 75
Statsgruvor A. B. ..... Mar 81
Steel Co. of Canada Ltd. Feb 77, Mar 88, June 91, Nov 76
Steep Rock Iron Mines ... Jan 73, May 88, Aug 81, Sept 103
Stelco Mines Quebec ..... June 91
Stoltzburg Asbestos Holdings Ltd. ..... Feb 78
Stora Kopparbergs Bergslags A/B ..... Feb 76, Sept 104
Strategic-Udy Metallurgical and Chemical Processes, Ltd. ..... June 92
Suidwes Afrika Prospekteerders Ltd. ..... Jan 71
Sulfacid S. A. ..... June 91
A/S Sulitjelma Gruber ..... Dec 63
Sulphide Corp. (Pty.) Ltd. Sept 119
Sumitomo Chemical Co. May 82, June 87
Sumitomo Metal Mining Co. May 88, Nov 78
Sungei Besi Mines Ltd. July 77, Nov 81
Sunshine Lardeau Mines, Ltd. ..... June 92
Minas Asociadas del Sur Sept 114
Suriago Consolidated Mining Co. ..... May 79, 84
Svenska Entrepreuad A. B. July 85
Swaziland Iron Ore Development Co., Ltd. ..... Nov 91
Swedish Lamco Syndicate .. July 85
A/S Sydvaranger ..... Aug 81

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Table-land Tin N. L. ..... Feb 80
Taiga Mines ..... Aug 83
Takahasi, C. T., & Co., Ltd. ..... Nov 69
Tamarac Mines, Ltd. .... Nov 80
Cia. Minera Tamaya S. A. Mar 79
Tarapaca-Antofagasta Nitrate Co. ..... July 82
Tata Iron & Steel Co. ..... Dec 64
Taurcanis Mines Ltd. ..... Apr 58
Taylor-Woodrow Construction, Ltd. ..... Mar 79
Teck-Hughes Gold Mines Apr 58, May 88
Tekka Ltd. ..... July 77
Tekko-sha Co. ..... Sept 108
Temagumi Mining Co., Ltd. May 88
Tennant, C., Sons Co. ..... Apr 55
Territory Enterprises Pty. Ltd. ..... Sept 119
Territory Mining Co. (formerly: Eastern Metals Corp.) ..... Oct 77
Tharsis Sulphur & Copper Co., Ltd. ..... July 83
Thorium Ltd. ..... Dec 63
Cie. de Tifnout-Tiranimine Nov 91
Tihua Mines ..... Feb 73
Tin & Associated Minerals Ltd. ..... Aug 79
Tin Fields of Nigeria Ltd. Apr 53
Titania A/S ..... June 86
Toa Phosphate Co. ..... Nov 86
Toho Zinc ..... June 87
Tombill Mines ..... Sept 114
Tong-A Metal Refining Co. Mar 83
Tongkah Harbour Tin Dredging Ltd. ..... Mar 83
Cia. Mines de Toronto .... Apr 52
Trafikaktiebolaget Grangesberg-Oxelosund ... May 85, July 85, Sept 104, Oct 81, Dec 63
Trans-Canada Explorations Mar 90
Transcontinental Resources Ltd. ..... June 92, Dec 19
Trans Western de Venezuela July 82, Oct 73
Transvaal Gold Mining Estates ..... July 85
Trepca mine ..... Apr 52
Cie. Industrielle de Travaux Mar 79
Trojan Consolidated Mines Feb 77, Oct 75
Tromal Prospecting Ltd. ...Jan 81
Tronoh-Malayan group ....Jan 81
Tsumeb Corp. Ltd. ..... Apr 54
Tungsten Consolidated Ltd. Dec 62
Turkish Gulf Oil Co. .... July 77

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Uis Tin Mining Co. (SWA) Ltd. ..... June 85, Aug 78
Umgababa Minerals, Ltd. .. Dec 61
Umniati Exploration ..... July 86
Ungava Iron Ores of Canada ..... Sept 112
Unified Gold and Exploration Co. Ltd. ..... May 81
Union Miniere du Haut-Katanga Mar 79, July 7, 86, Nov 90
United Gypsum & Minerals, Inc. ..... Sept 120
United Kingdom Metal Mining Assoc. ..... Feb 75
United Tin Areas of Nigeria June 85, Nov 90
United Uranium, N. L. Feb 80, May 84, June 89, Aug 80, Sept 119
Universal Mineral Resources Apr 56
Uruwira Minerals Ltd. .... Dec 60
USSR Ministry of Geological Survey & Conservation of Minerals ..... Jan 78
Cia. Utah Pacific Ltd. .... Feb 73

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Vaal Reefs Exploration & Mining Co., Ltd. .....Nov 7, 78
Val d'Or Mineral Holdings Ltd. ..... May 88
Cia. Vale do Rio Doce Mar 79, July 7
Vares ..... Mar 81
Veitscher Magnesitwerke .. Jan 77
Venida, M., & Co., Inc. (MARAVENI) ..... July 88
Ventures Ltd. .... Jan 67, Mar 67
Venterspost Gold Mining Co. ..... Jan 70
Violamac Mines Ltd. Jan 72, Apr 58
Volcan Mines ..... Jan 69

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Wabush Iron Co., Ltd. Feb 77, Nov 76
Wattle Gully Gold Mines, N. L. ..... June 89
Weardale Lead Co., Ltd. .. May 87
Weedon Mining Corp (formerly: Weedon Pyrite & Copper Corp.) ..... Aug 83
Welkom Gold Mining Co. Jan 71, Aug 79
West Pakistan Mineral Development Corp. ..... Apr 56
West Rand Consolidated .. June 85
Westcan Iron Corp., Ltd. .. Dec 59
Western Aluminum N. L. Feb 80
Western Areas Gold Mining Co. ..... Nov 88
Western Deep Levels Ltd. Aug 79
Western Exploration Co. .. June 92
Western Mining Corp. Ltd. Feb 80
Western Nickel Ltd. ..... Aug 81
Western Stevedoring Co. ... Jan 61
Western Titanium N. L. .. Nov 85
Whiteacres Estate Pty. Ltd. Jan 77
Winkelhaak Mines Ltd. Mar 83, July 86

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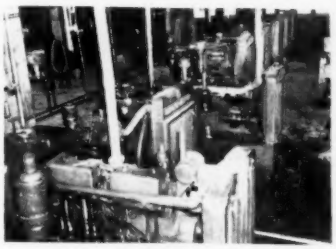

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Wanted ENGINEER-SUPERINTENDENT for 60 TPD lead, zinc, silver mining and milling operation, Central America, selective flotation. Good opportunity for energetic man experienced in both vein mining and milling; must speak and read Spanish, two-year contract, $550.00 per month plus travel allowance, furnished house with utilities, healthful climate 5000 ft. elevation. Reply giving experience, qualifications, education, marital status, children and ages, recent foto. Reply to Box Q-2, Mining World, 500 Howard Street, San Francisco 5, Calif.

MINE SUPERINTENDENT AND METALLURGIST REQUIRED

For mineral sand mining operation to be located in New Jersey. Excellent opportunities offered for men with right qualifications.

QUALIFICATIONS FOR MINE SUPERINTENDENT:

Age 30-45. Graduate of university or school of mines. At least eight years experience in open pit dragline operations where rigid control of mining path and depth was necessary. The last five years to have been in a senior supervisory capacity. Should be experienced in the use of heavy equipment pump preparation and planning.

QUALIFICATIONS FOR METALLURGIST:

Age 30-45. Graduate of university or school of mines with degree in metallurgy. Must be experienced in the concentration and separation of sand ilmenite ores using spirals and other wet gravity methods. Also high tension and magnetic separation of ilmenite and related minerals. Should be qualified to take over duties of mill superintendent when plant is in operation.

Applications from completely qualified men alone will be considered. Reply with complete details and salary desired to:

Manager, Mining Division
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RD. #4, Box 150
Lakewood, New Jersey

GEN. SUPT.—ASST.—SMALL or MED. SIZED MINE: Experienced U.G. and surface mining; cyanide, flotation milling; mine plant administration; cost conscious; can organize work; 44; domestic or foreign; mod. salary plus prod. bonus. Reply to Box R-1, Mining World, 500 Howard Street, San Francisco 5, Calif.

FOR SALE OR LEASE: 66 Old lode claims in Santa Rita Mts. of Arizona, contain copper and molybdenum. Excellent terms. Write R. H. Harpster, 5632 East Alpine, Tucson, Arizona.

FOR SALE or LEASE: quarry-building stone and armor rock, near fast growing Orange County and large contracts. Opportunity for organization with know-how and available equipment. P. O. Box 934, Laguna Beach, California.

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New Turbine Type Propeller Agitators have been developed up to 120" in diameter propeller size for use in large diameter tanks. This permits operation at slower speeds and at lower horsepower, yet effective agitation is obtained with pulps and slurries as coarse as 8 mesh. Special propeller blade design features eliminate cavitation, minimize wear, assure long life.

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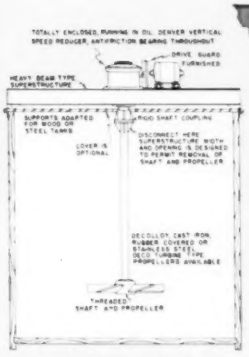

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SIZES TO 120" AND LARGER DIAMETER

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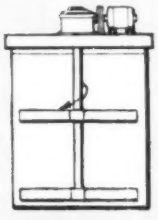
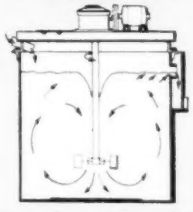


PADDLE AGITATOR

DENVER Paddle Agitators are designed for applications involving the gentle mixing of solutions or slurries containing solids of fine particle size. Equipped with DENVER vertical shaft speed reducer.

✻ DENVER Agitators for Mixing, Precipitation, Stripping



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DENVER supplies agitators of the vertical turbine type for intimate mixing, precipitation and stripping. A complete line of worm gear drive units are available to power these impellers at correct horsepower and speed for your applications. Mixing propellers available in full range of sizes to provide desired mixing intensity.

✻ **DENVER can supply Agitators and Mixers in a full range of types and sizes . . . for conditioning, mixing, scrubbing, leaching, precipitation, aeration, etc., for either batch or continuous operation. Write for Bulletin No. A2-B4.**

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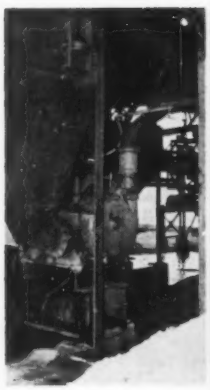

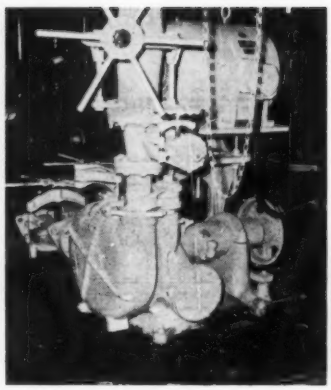

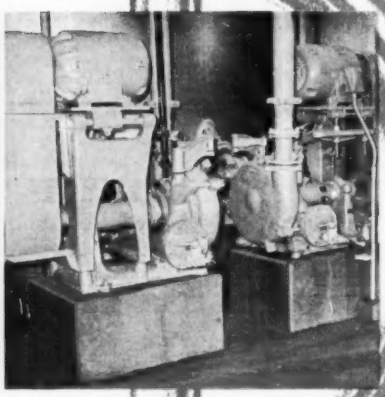

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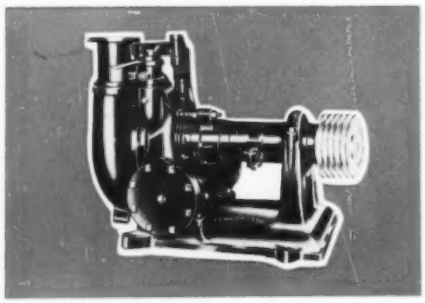

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